AUTOMOTIVE INDUSTRIES

PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT • SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

JUNE 1, 1950

In This Issue . . .

Federal's Style Liner Trucks

Development of Wedge Type Belt

Special Casting of Torque Converter Parts

Effects of Mechanical Octane Numbers

Machining F-Type Cylinder Heads

Complete Table of Contents, Page 3

A CHILTON PUBLICATION

What's YOUR problem?

R. L. Jenkins, lubricating specialist at Standard Oil's South Bend office solved this customer's problem because he was thoroughly familiar with job requirements and the application of his Stanorust line.

There is a corps of such lubricating specialists throughout the Midwest, trained and experienced to help plant operators solve similar problems. Experience enables these men to find quickly the cause of lubricating troubles. Knowledge of petroleum products enables them to prescribe the lubricant needed. There is one of these lubricating specialists at the Standard Oil Company (Indiana) office near you. He is there to serve you. A call or a card will put him at your service.

Investigate the cost-saving possibilities of these lubricants.

STANOIL INDUSTRIAL OILS—for cleaner hydraulic systems, gear cases, compressors, and circulating systems.

CALUMET VISCOUS LUBRICANTS—adhere to open gears and chain drives without throw-off. Easy to apply. No heating.

STANOLITH GREASE—withstands high temperatures and resists washing by water.

THE SHOP FOREMAN of Hart Pressed Steel Corp., Elkhart, Indiana, exposes the clean metal surface beneath a coating of STANORUST 1-XC Rust Preventive by a simple wiping operation. The die shown has been protected against rust under severe outdoor conditions for over a year by STANORUST 1-XC.

How to prevent rust under severe outdoor storage . . .

RAIN, snow, heat, cold—plus coal soot from passing locomotives—could be expected to produce serious rust troubles in outside storage. The elements did, indeed, cause difficulties for the Hart Pressed Steel Corp., Elkhart, Indiana, which owns the truck and trailer dies shown above. Despite coatings of heavy oil, rusting was so severe that cleaning a die required at least three hours.

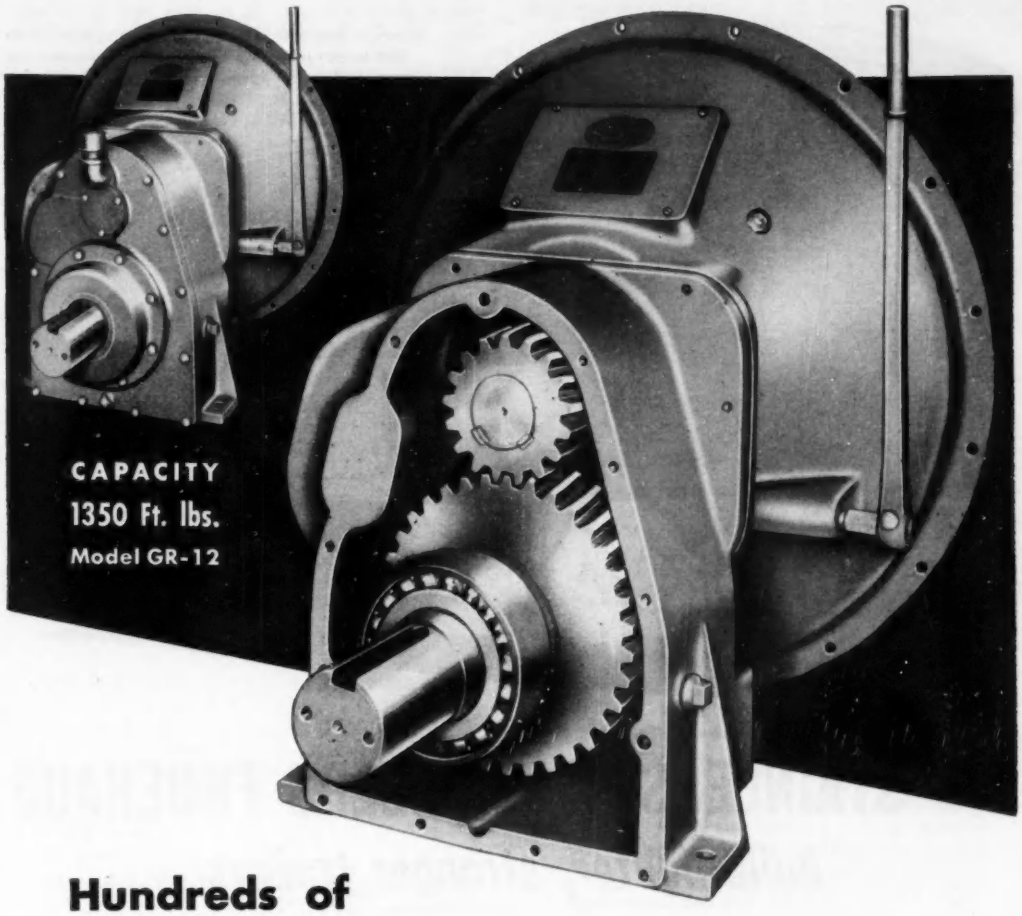
The problem was laid before a Standard Oil lubrication specialist. He pointed out that, to withstand severe outdoor exposure, a rust preventive with special qualities is needed. At his suggestion, the dies were coated with STANORUST 1-XC, a rust preventive especially developed for severe outdoor service.

Use of a STANORUST Rust Preventive has made savings for this company. Many of the dies have been exposed to the weather for over a year, yet STANORUST has kept them completely protected against rust. A die can now be cleaned and returned to service in a matter of ten minutes, as compared with the three hours previously required.

The new and improved STANORUSTS can mean big savings for you through more economical applications, better rust protection. There's a lubrication specialist near you who can help you get the most economical results. How you can obtain his services is described at left. Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANORUST
REG. U. S. PAT. OFF.
RUST PREVENTIVES

STANDARD OIL COMPANY (INDIANA) STANDARD



Hundreds of Cotta REDUCTION UNITS

. . . used in many industrial applications: cranes, shovels, rock crushers, generators, pumps, and the like. Particularly suited for adjusting high-speed Diesel output to the r.p.m. of slower-speed units. Available in a broad range of ratios . . . Input torque ranges from 150 foot pounds to 1350 foot pounds. Each reduction unit is COTTA precision engineered throughout.

THIS INFORMATION WILL HELP YOU

Sent free on request — diagrams, capacity tables, dimensions, and complete specifications. State your problem — COTTA engineers will help you select the right unit for best performance. Write today.

COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS

An Assurance of Dependable Service

COTTA
HEAVY-DUTY
TRANSMISSIONS
"Engineered-to-order"

Stainless Steel vans of this new type built by Fruehauf are 3000 to 4000 pounds lighter than conventional trailers and up to 1050 pounds lighter than old stainless steel models.

How STAINLESS STEEL HELPS FRUEHAUF

build lighter, stronger trailers

WEIGHT is designed OUT of this new Fruehauf trailer by wide use of 18-8 austenitic chromium-nickel stainless steel...

Specified in 18-8, all basic structural parts... roof, sides and cross-members... are welded into a stronger, rugged unit by the "Shotweld" process.

The 18-8 stainless permits use of thinner gauges *to cut deadweight while increasing strength.* It also assures longer service life, because the chromium-nickel alloy steel withstands impacts and rough usage in loading and on the road.

Chromium-nickel stainless steels resist the corrosive attacks of rain, sleet and ice, wear and abrasion. You can draw, spin, forge, weld, solder, punch, shear and bend 18-8 stainless. Leading steel companies produce austenitic chromium-nickel stainless steels in all commercial forms. A list of sources of supply will be furnished on request.

EMBLEM OF INCO SERVICE

Over the years, International Nickel has accumulated a fund of useful information on the properties, treatment, fabrication and performance of engineering alloy steels, stainless steels, cast irons, brasses, bronzes, nickel silver, cupro-nickel and other alloys containing nickel. This information is yours for the asking. Write for "List A" of available publications.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

AUTOMOTIVE INDUSTRIES

Published Semi-Monthly

June 1, 1950 Vol. 102, No. 11

Contents

High Spots of This Issue	15
News of the Automotive Industries	17
Men in the News	25
Calendar of Coming Events	25
Latest Development of the Wedge Type Belt. By Gordon I. McNeil	30
Recent Applications of Versatile Hydraulic Presses	33
IHC Adopts Newest Type Transfer Machines for Truck Engine Production. By Joseph Olender	34
Federal Announces New Series of Commercial Vehicles	37
Unusual Machining Methods for Powerglide Castings. By Joseph Geschelin	38
Effects of Mechanical Octane Numbers. By S. D. Heron and A. E. Felt	42
New Machine Line for F-Type Cylinder Heads. By William E. Paris	46
Turin Show Features Cars from Eight Nations. By Michael Chinigo	49
Making Torque Converter Parts by Plaster Casting Process. By Joseph Geschelin	50
New Production and Plant Equipment	52
New Products	56
Publications Available	62
Business in Brief	68
Advertisers' Index	100

Copyright 1950 by Chilton Company (Inc.)

One of the Publications Owned by

CHILTON COMPANY (INC.)

Executive Offices

Chestnut and 56th Streets, Philadelphia 39, Pa., U. S. A.

Officers and Directors

Jos. S. HILDRETH, *President*

Vice-Presidents

EVERIT B. TERHUNE P. M. FAHRENDORF G. C. BUZBY
WILLIAM H. VALLAR, *Treasurer* JOHN BLAIR MOFFETT, *Secretary*
HARRY V. DUFFY D. ALLYN GARBER
GEORGE T. HOOK MAURICE E. COX
TOM C. CAMPBELL L. V. ROWLANDS FRANK P. TIGHE

GEORGE MAISWINKLE, *Asst. Treas.*

OFFICES

Philadelphia 39, Pa., Chestnut & 56th Sts., Phone GRanite 4-5600
New York 17, N. Y., 100 East 42nd St., Phone Murray Hill 5-8600; Chicago 1, Ill., Room 914, London Guarantee & Accident Building, Phone Franklin 2-4243; Detroit 2, Mich., 1015 Stephenson Bldg., Phone Trinity 5-2090; Cleveland 14, Ohio, 1030 National City Bank Bldg., Phone CHerry 1-4183; Washington 4, D. C., 1091 National Press Bldg., Phone Sterling 1844, 1845 and 1846; San Francisco 3, Calif., 605 Market St., Room 608, Phone Sutter 1-4981; Los Angeles 1, Calif., 6000 Miramonte Blvd., Phone LaFayette 5525.

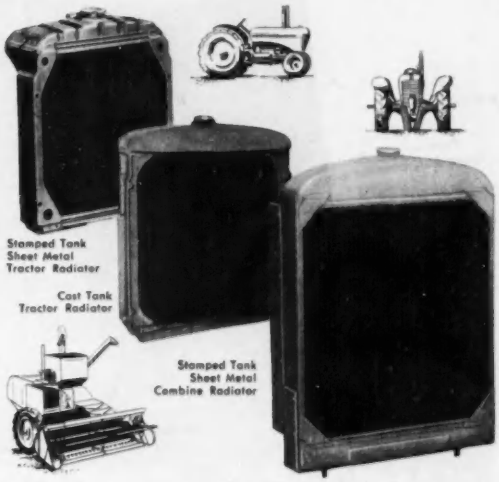
Cable Address ..... Autoland, Philadelphia

Member: Audit Bureau of Circulations

AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly), May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

Farm equipment manufacturers:

ARE YOU GETTING THE MOST FOR YOUR RADIATOR DOLLAR?



See the newest Young design features before you decide

There *is* something new in tractor and implement radiators! Let us show you how Young engineering, modern production machines, and careful attention to details in manufacturing combine to produce radiators that are simpler in design, less costly to make, and more efficient in performance. This, we believe, explains the fact that more and more manufacturers of farm and industrial tractors and self-propelled farm implements are turning to Young for their heat transfer requirements.

Be sure *you* are getting the best possible radiator value. Send us your requirements, let us show you our product, then compare our proposal. Incidentally, we can offer similar economies, including *complete* "packaged cooling," in passenger car, truck, bus, aircraft and stationary engine applications.

YOUNG

HEAT TRANSFER PRODUCTS FOR AUTOMOTIVE AND INDUSTRIAL APPLICATIONS.

HEATING, COOLING, AND AIR CONDITIONING PRODUCTS FOR HOME AND INDUSTRY.

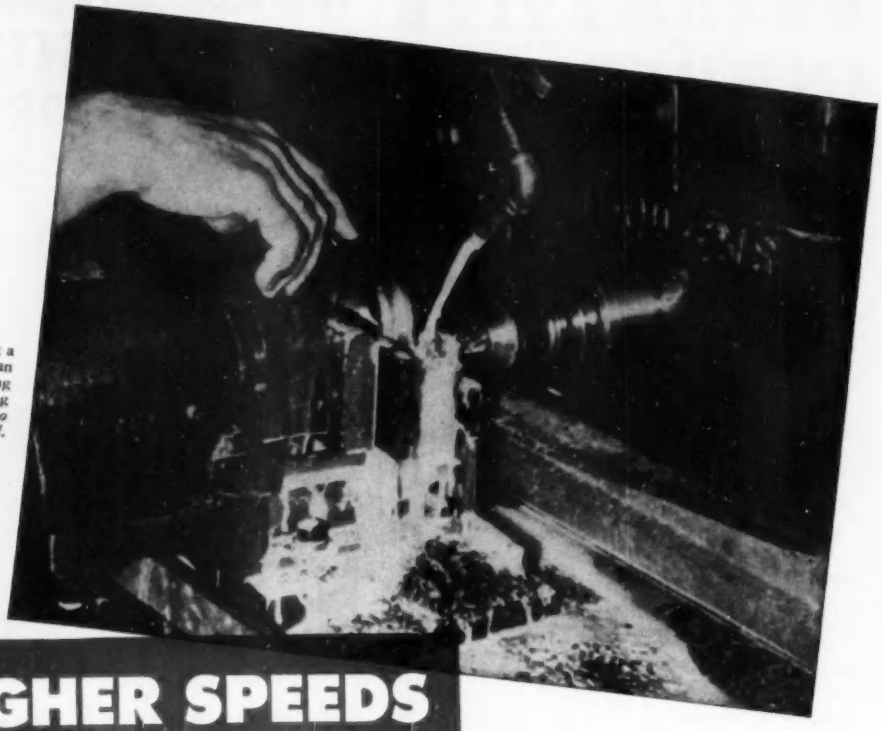
T.M. REG. U.S. PAT. OFF.

YOUNG RADIATOR COMPANY

DEPT. 100-F, RACINE, WISCONSIN

Plants at Racine, Wisconsin and Mattoon, Illinois

AUTOMOTIVE INDUSTRIES, Vol. 102, No. 11, Published semi-monthly by Chilton Co., Chestnut & 56th Sts., Phila. 39. Entered as Second Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, Mexico, United States Possessions, and all Latin-American countries, 1 year $2.50, 2 years $3.00. Canadian and Foreign $5.00 per year; single copies, 25 cents, except Statistical Issue (Mar. 15th), $1.00.



Milling a free-way in an inner ball bearing race. The cutting coolant is *Texaco Soluble Oil.*

HIGHER SPEEDS LOWER COSTS

ASSURED when you use Texaco cutting fluids

Take the word of experienced operators everywhere for this fact: whatever metals you are cutting, whatever machining operations you are performing, you'll increase your output and reduce your costs by using *Texaco Cutting, Grinding and Soluble Oils.*

With the right *Texaco Cutting, Grinding and Soluble Oils* on the job, you can machine faster, improve finish and reduce rejects. At the same time, you'll get more cuts per tool grind, longer tool life . . . you'll prevent chip welding or wheel loading . . . save production time and materials.

Let a Texaco Lubrication Engineer specializing in cutting fluids help you select the proper *Texaco Cutting, Grinding and Soluble Oils* for best machining results. Just call the nearest of the more than 2,000 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N .Y.

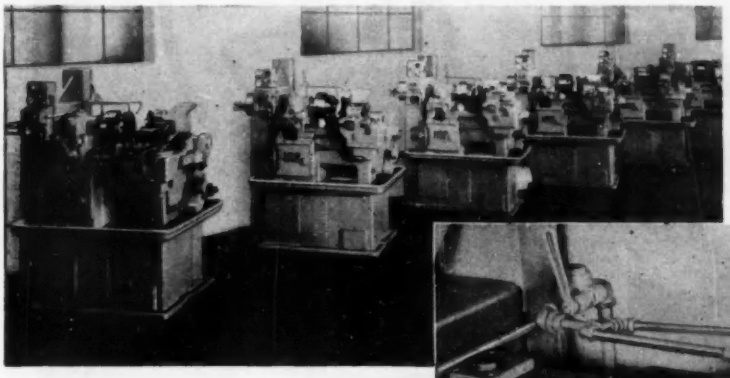
TEXACO

TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

TUNE IN . . . TEXACO STAR THEATER starring **MILTON BERLE** on television every Tuesday night. See newspaper for time and station.

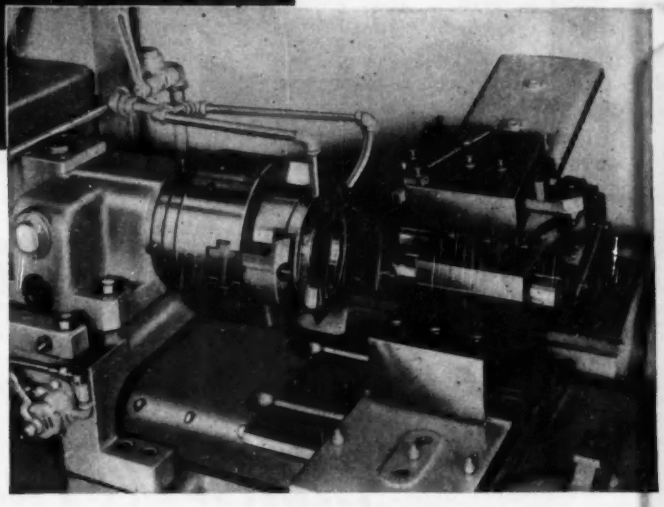
MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



Left: Several of a group of Lo-swing IMP's used in machining Automatic Transmission Parts.

Below: Close-up view of tooling.



AUTOMATIC TRANSMISSION PARTS MACHINED AUTOMATICALLY ON Lo-swing IMP

Problem: To bore and face welded Torque Converter Stator Assemblies. Parts must be held without distortion and machined within close limits.

Solution: IMP Automatic Lo-swing Lathes were selected for this work due to ease of operation, high spindle speeds, compactness and rigidity. The upper illustration shows several of a group of machines installed for this class of work. The lower illustration shows one of the lathes, with coolant guard removed, equipped for boring and facing one of the Torque Converter Stator Assemblies. The part is held in a three-jaw, air-operated chuck fitted with wide mushroom type jaws to prevent distortion of the piece. The boring operation is made with two carbide tipped tools mounted in a boring bar and holder and fitted to the front slide. Tool relief is provided on the return stroke. The facing and trimming tools are mounted on a template controlled rear tool block which permits the facing operation to be made at the correct angle. The operation is entirely automatic, the operator simply loads and unloads the parts.

Engineered jobs are our specialty. Our staff is at your disposal to help solve your problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

First the Problem...then the Product ...then the Payoff

How to design the piece or part . . . with metal, rubber, plastic, friction materials or a combination of two or more of them . . . in the automotive or other industry? That's the *problem*. How to produce the piece in quantities of hundreds, thousands or millions, with the utmost simplicity and speed, yet with exact duplication of specifications in each unit? That's the *product*. And the *payoff*, of course, is *slashed production costs* for the industrial purchaser of the part, plus *satisfaction in service* for the ultimate user of the maker's products.

Inland has been doing it that way for more than a quarter of a century . . . with ingeniously simplified functional designs . . . with precise laboratory control of each step in production . . . with cost-saving results.

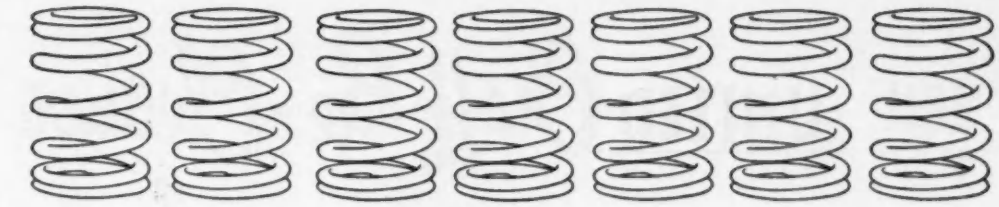
If you have a problem that demands an *engineering and production solution*, ask for Inland's collaboration. The solution may be ready now, in the record of Inland's vast experience. If it isn't . . . *the problem can be solved!*

INLAND MANUFACTURING

INLAND MANUFACTURING DIVISION
General Motors Corporation • Dayton, Ohio

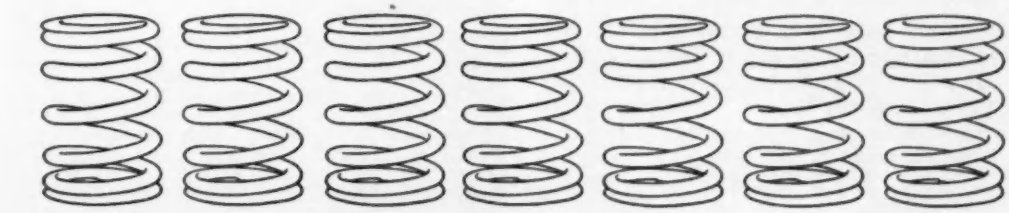
INLAND MANUFACTURING

WHERE PROBLEMS BECOME PRODUCTS
in Rubber, Metals, Plastics and Friction Materials



ALL you need to know . . .

for all you need in **Springs**



U. S. DIVISIONS OF ASSOCIATED SPRING CORPORATION AND CANADIAN AFFILIATE

new UNITED Chaff Pre-Cleaner

★ **FITS PRACTICALLY ANY AIR CLEANER**

★ **TRANSPARENT PLASTIC SHELL**

UNITED PRE-CLEANER
IMPORTANT
THIS PRE-CLEANER DOES NOT ELIMINATE SERVICING OF THE OIL BATH AIR CLEANER, BUT PROLONGS THE SERVICE PERIOD.
EMPTY WHEN DUST LEVEL IS REACHED
REMOVE WING NUT ASSEMBLY AND LIFT PLASTIC BODY FROM BASE, SHAKE DUST FROM DIRT COMPARTMENT, AND REPLACE CLEANER.
UNITED SPECIALTIES CO., Chicago, Ill., U.S.A.
DUST LEVEL
DUST LEVEL

Here is another new United development — a chaff pre-cleaner that can be easily attached to practically any center tube air cleaner installation. Designed with special fittings, this chaff pre-cleaner is adaptable to 95 percent of all wheel tractors, agricultural equipment and industrial power units.

Attached to the regular oil bath air cleaner, this unit assures maximum engine protection. It removes a large percentage of chaff, dust and linty materials from air before it enters the filter unit of the oil bath air cleaner. The pre-cleaner prevents clogging — keeps the air cleaner operating at top efficiency.

The outside shell of the pre-cleaner is made from durable, transparent plastic — the dirt pickup is visible to the operator at all times.

Pioneer builder of oil bath air cleaners, United offers over 260 air cleaner models — a size and type to fit any internal combustion engine. Inquiries regarding the new United pre-cleaner or any of our air cleaner designs will receive immediate attention.

UNITED SPECIALTIES COMPANY

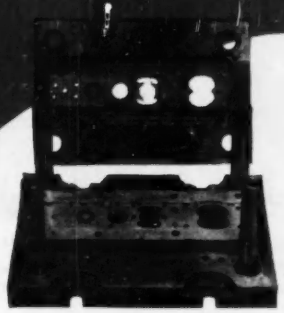
United Air Cleaner Division, Chicago 28
Mitchell Division, Philadelphia 36

AIR CLEANERS ★ METAL STAMPINGS
DOVETAILS ★ IGNITION AND TURN
SIGNAL SWITCHES ★ ROLLED SHAPES

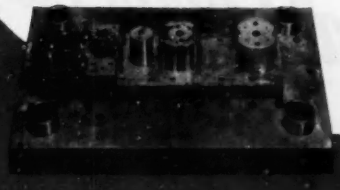
160 pieces a minute to tolerances of less than .0005"!

they built the die in a

DANLY PRECISION DIE SET



Die built by the Sherman Tool & Die Co., Charlestown, Massachusetts, for the Signal Manufacturing Co., Lynn, Massachusetts, in a Special Danly Precision Die Set



Danly precision makes every Danly Die Set a reliable base for the finest die work. They save time in the die shop because they are square and true . . . they assure longer production runs in the press because precision closure protects die components.

Standard Danly Die Sets are quickly available from a nationwide system of completely stocked assembly branches. Just phone for fast delivery, and for the finest in die set precision, always specify Danly.

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue Chicago 50, Illinois

DANLY
®

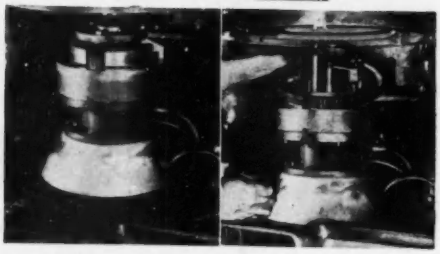
PRECISION DIE SETS . . . STANDARD AND SPECIAL

MACHINES USED	ONE SHEAR-SPEED (internal)	ONE SHEAR-SPEED (external)	
Part Produced	Cylinder (housing)	Pressure Plate	Hydr. Piston Plate
Approx. Pitch Diameter	12"	12"	12"
Length of teeth cut (in.)	1.016	.976 (2 pcs.)	.562 (2 pcs.)
Output per hour	85-90	200-240	200-240
Machine Cycle Time	24 secs.	24 secs.	24 secs.
Estimated Tool Maintenance Cost	***	1/10th that for generating tools	
Change-over time	None Required	Approx. 2 hrs. total (complete set-up)	
Equivalent number of generating machines for same production	12 (single spindle)	Six (8-spindle type)	

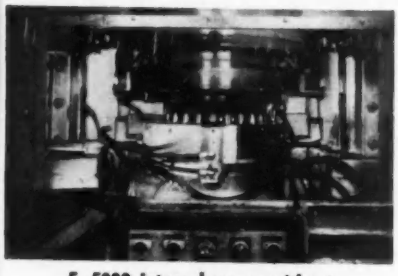
***—No tool grinding required in first 5000 pieces produced.

Maximum Allowable Errors: Involute profile .....0.0004 in.; Index .....0.001 in. with any tooth; Parallel.....0.001 in. per inch of tooth

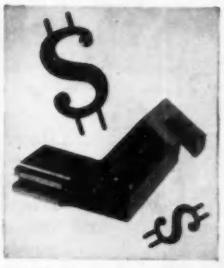
1. This 12" diameter internal gear . . . *finish-cut in only 24 secs.!*



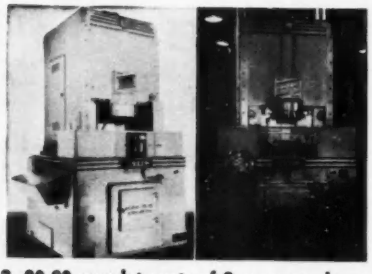
2. Two mating 12" external gears . . . *in another 24 secs.*



5. 5000 internal gears *without a tool grind.*



4. Tool cost per piece . . . *cut 90%.*



3. 80-90 complete sets of 3 gears per hour . . . *on only two machines.*

6. Precision finishing . . . *to 0.0004" on profile.*

That's gear cutting, Packard!

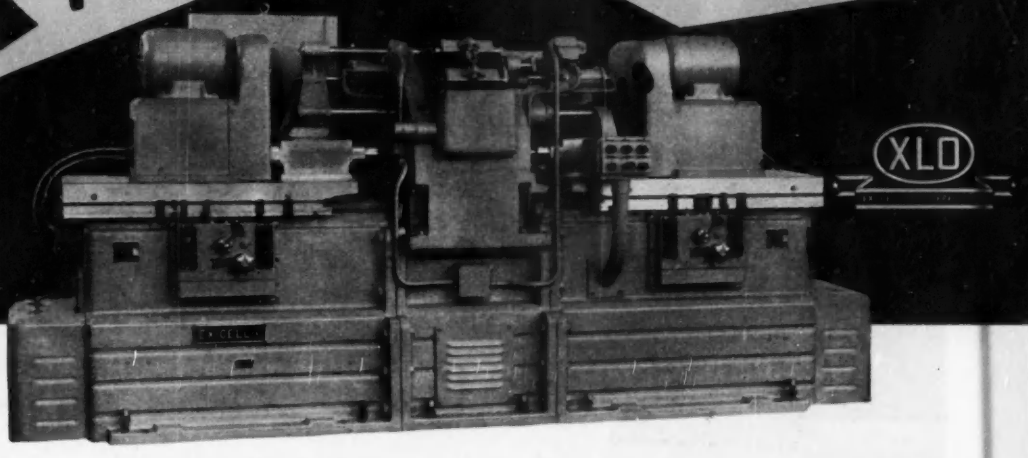
For information on Shear-Speed machines—for form-cutting of internal or external spur gears, splines or other irregular forms—ask for Bulletin 1800-47

COMPLETE from blank to finished gear EQUIPMENT

MICHIGAN TOOL COMPANY

7171 E. McNichols Road
Detroit 12, U.S.A.

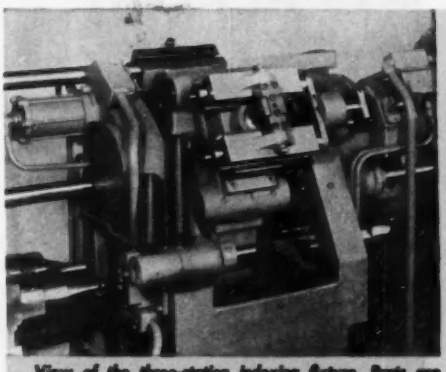
DOUBLE ACTION FOR DOUBLE PRODUCTION



EX-CELL-O TWO-WAY MACHINE BORES, CHAMFERS, AND FACES BOTH ENDS OF TUBULAR STEEL PARTS AT NET RATE OF 366 PIECES PER HOUR!

Ex-Cell-O Way Type Precision Boring Machines save time by machining parts from two or more directions at the same time. And relationship of the various operations to one another is exact because the accuracy is built into the machine—it does not depend on the accuracy of repeated locating and clamping.

The machine illustrated here has a trunnion type indexing fixture, machines both ends of two parts per cycle, ejects the finished work automatically. Have your Ex-Cell-O representative explain all the advantages of these machines to you, or write today to Ex-Cell-O in Detroit for further information.



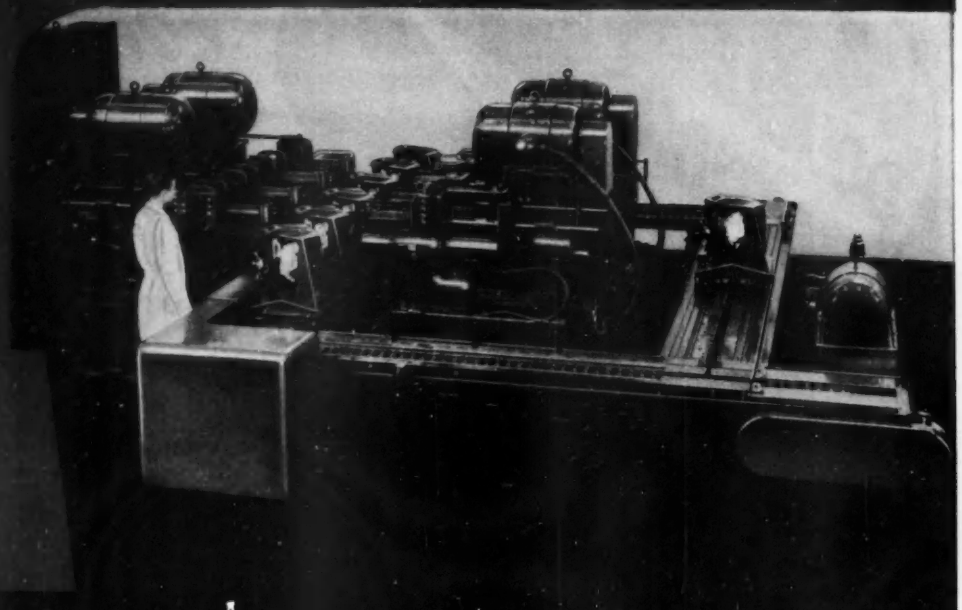
View of the three-station indexing fixture. Parts are loaded in upper station, machined in lower station, automatically unclamped and ejected from rear station.

EX-CELL-O CORPORATION DETROIT 32 MICHIGAN

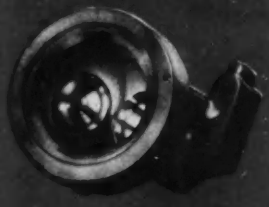
MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

50-2

Another Transfer-matic by Cross



Drills and Bores Aircraft Cylinder Heads



- ★ 80 pieces per hour at 100% efficiency
- ★ 5 stations—1 loading, 4 cutting
- ★ Rough drills and forms valve pockets and spring compartments; finish bores valve guide hole, insert seat and spring seat
- ★ Palletized work holding fixtures with interchangeable adapters for holding four parts
- ★ Stub tools for drilling and forming—no drill or guide bushings
- ★ Coolant directed through spindles and tools to cutting points

Established 1898

THE **CROSS** CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

Pumps are Part of Automotive Progress

1925

Lubrication

1950

Lubrication, Fuel, Windshield Wiper, Window Lift, Top Lift, Hydraulic Transmission.

19?

Lubrication, Fuel, Windshield Wiper, Window Lift, Top Lift, Rear Deck Lift, Hydraulic Transmission, Hood Lift, Seat Adjuster, Ride Control, Steering, Tire Jack, Brake Booster, Door Closer.

EATON ROTOR PUMPS

EATON MANUFACTURING COMPANY

GENERAL OFFICES: CLEVELAND, OHIO

Pump Division

9771 FRENCH ROAD • DETROIT 13, MICHIGAN

Bendix Products Division

CREATIVE ENGINEERING

GEARED TO QUANTITY PRODUCTION

TAKE ADVANTAGE OF THE TREND TO

HYDROVAC

THE WORLD'S FASTEST SELLING POWER BRAKE

Every day more and more commercial vehicle operators are turning to Hydrovac* as the final answer to their power braking problems. This unrivalled preference presents to manufacturers, whose vehicles are factory equipped with Hydrovac, a pre-sold market of vast proportions. Further, the millions of Hydrovac units in daily use furnish a potential service and replacement business that any alert dealer organization would welcome.

There is an added sales feature for the commercial vehicle manufacturer who standardizes on Hydrovac—the best proven and *most* popular power brake in the world. *REG. U.S. PAT. OFF.

BENDIX · PRODUCTS DIVISION · SOUTH BEND

AVIATION CORPORATION

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N. Y.
Canadian Sales: Bendix-Eclipse of Canada, Ltd., Windsor, Ontario, Canada

BUILDERS OF THE BASICS OF BETTER MOTOR VEHICLES

AUTOMOTIVE INDUSTRIES

EDITORIAL STAFF

J. R. Custer, Editor
Jos. Geschelin, Detroit Editor
H. H. Roberts, Engineering Editor
Mareus Ainsworth, Statistician
W. T. Bostelman, News Editor
Jerome H. Farris, Ass't Editor
Robert P. Homer, Ass't Editor
Thomas MacNew, Ass't Editor
Leonard Westrate, News Editor, Detroit
E. J. Hardy, Washington Editor
Karl Rannells, Washington News Ed.
George H. Baker, Washington News Ed.
R. Raymond Kay, Pacific Coast Ed.
Howard Kohlbrenner, Art Director
W. F. Bradley, European Correspondent

•

Paul Wooton, Washington Member, Editorial Board

•

BUSINESS DEPARTMENT

G. C. Buzby, President and Manager Automotive Division
E. H. Miller, Adv. Mgr.
E. W. Hevner, Cir. Mgr.

•

REGIONAL BUSINESS MANAGERS

John T. Hoole, Chicago
E. E. Elder, Detroit
Nelson W. Sieber, Philadelphia and New York
Jack C. Hildreth, Cleveland
C. H. Woolley, San Francisco
August Haurin, Jr., Los Angeles

•

AUTOMOTIVE INDUSTRIES
Reg. U. S. Pat. Off.

High Spots of This Issue

★ Wedge Type Belt Developments

This type belt has been used in production on Cadillac, Oldsmobile, Kaiser-Frazer, Nash, Ford, Mercury and Lincoln. The author analyzes its qualities and qualifications, suggesting belief why the wedge type belt ultimately offers to the industry a better, cheaper drive than the present type on many automobiles. Page 30.

★ IHC Newest Transfer Machines

Most of the ten new transfer machines at International Harvester's Indianapolis, Ind., plant are used for producing cylinder blocks and cylinder heads for the new Silver Diamond truck engine. This article details the work of four of these most modern transfer machines, namely—the Ingersoll, Footeburt, Sunstrand and Natco. See page 34.

★ Machining Powerglide Castings

This third article in a series on manufacture of the Chevrolet Powerglide Transmission describes some unusual machining methods undertaken in the production of castings at the Chevrolet-Cleveland plant. Fabrication of the unique planet carrier and output shaft assembly unit is also noted. Page 38.

★ Effects of Mechanical Octane Numbers

Data obtained with a 3¼-in. bore by 3¼-in. stroke single cylinder engine which was designed and built for exploration of compression ratio and other effects of interest in the passenger car engine field are here presented in condensed form. Turn to page 42.

★ Torque Converter Parts Made by Plaster Casting Process

Making of the rotating elements of the torque converter for the Ultramatic drive posed unusual problems for Packard. How the Alcoa plaster casting technique and compact mass production setup solved them is the subject of this story, appearing on page 50.

★ 17 New Product Items And Other High Spots, Such As:

Recent applications of versatile hydraulic presses; new series of commercial vehicles announced by Federal; the new machine line for F-Type cylinder heads at Willys-Overland; and the Turin Show which featured cars from eight nations.

News of the Automotive Industries, Page 17
For Complete Table of Contents, See Page 3

No Flats Permitted

"Teeth must be accurately spaced and must come to a sharp point, no flats permitted" . . . said a prominent manufacturer of business machines. These basic specifications are part of the requirements for two styles of cams, illustrated in the drawing, one of which has serrations throughout an arc of 290°.

Cincinnati Application Engineers studied the job and decided that broaching was the lowest cost method. They assigned the work to a CINCINNATI No. 1-30 Single Ram Vertical Hydro-Broach, completely tooled up for production. 289 of the larger and 540 of the smaller parts are broached per hour.

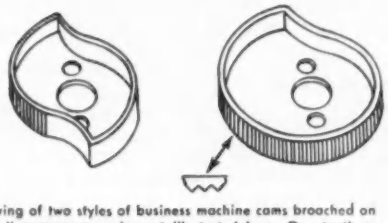
Tooling consists of two readily interchangeable fixtures and two sets of broaching inserts (cutters), one for each part. The larger cam is broached one at a time, while the fixture for the smaller cam holds two abreast, and two parts are broached each stroke of the ram. ¶This example again shows how Cincinnati Application Engineers tool up surface broaching operations for the lowest cost production. They can do just as much to lower your production costs of parts weighing less than one ounce to those as large as automotive cylinder blocks. It costs nothing to inquire. Write to Department E. S.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINCINNATI No. 1-30 Single Ram Vertical Hydro-Broach Machine. This illustration gives you an over-all view of the machine. Write for specifications.

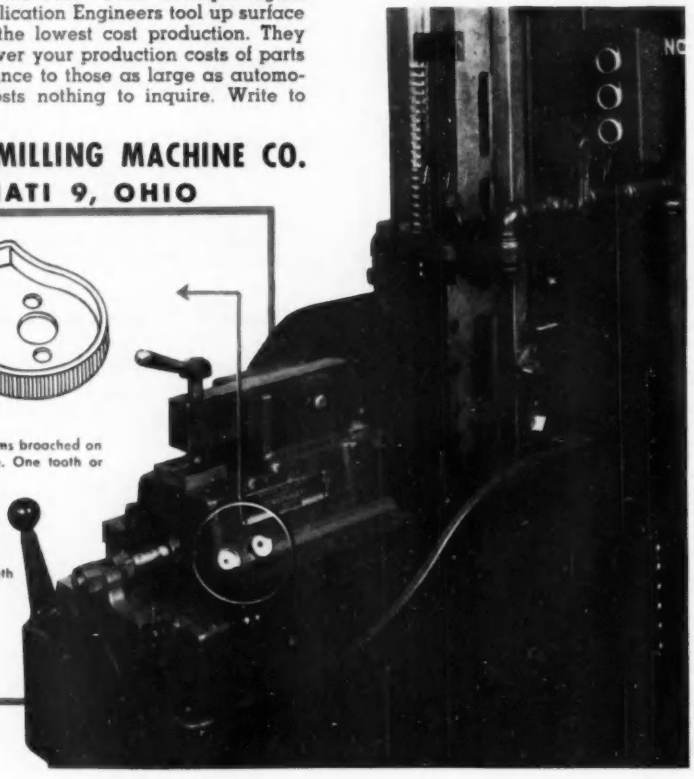
CINCINNATI

REPLACE WITH A NEW CINCINNATI



Drawing of two styles of business machine cams broached on the all-CINCINNATI equipment illustrated here. One tooth or segment is enlarged.

Part name	Operating cam	
Material	Steel	
Operation	Broach 82 teeth	Broach 27 teeth each side
Production	289 per hour	540 per hour
Equipment	CINCINNATI No. 1-30 Single Ram Vertical Hydro-Broach with complete tooling.	



Close-up of all-CINCINNATI equipment for broaching the serrations in business machine cams.

Cincinnati

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

News of the AUTOMOTIVE INDUSTRIES

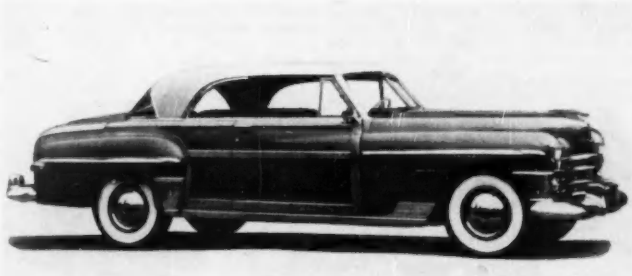
Vol. 102, No. 11 June 1, 1950

Chevrolet Goal This Year Nearly 2 Million Units

Chevrolet is planning to build about two million cars and trucks this year, according to T. H. Keating, Chevrolet general manager and GM vice president. Production schedules during June will be pushed to new heights, and according to present plans, output for the first half of this year will be about 2000 units short of one million. For the entire year, Chevrolet is expecting to build about 400,000 trucks and 1.5 million passenger cars.

Oldsmobile, Cadillac, Nash Win in Mexican Race

Three American automobiles took top places in the Mexican-Pan-American Stock Car Race extending 2178 miles from the northern to the southern border of that country. The first place was won by a 1950 Oldsmobile with a time of 27 hours, 34 minutes and 25 seconds A Cadillac came in second, one minute and 16 seconds behind the winner. Third place was won by a Nash Ambassador with a total time of 27 hours, 50 minutes and 35 seconds. Average speed for the winning car was 78.2208 mph. A total of 132 American and foreign-built cars entered the race with only 52 finishing. The course was particularly treacherous including unpaved roads, treacherous curves in the mountains and such obstructions as cattle, carts, and pedestrians. The first place winner received $17,183; second place, $11,570; and third place, $5785.



SOLID SAFETY

Chrysler has announced the production of this new Town and Country Newport model which combines convertible style with the safety of a permanent solid top. Powered by an eight-cyl 135-hp engine this car has a 131½ in. wheelbase. The new Chrysler hydraulic disk brake is standard.

Steel to Car Industry Set New Record in March

Shipments of steel to the automotive industry set a new high in March: 1,208,000 net tons, compared with 1,082,000 in February, and 1,086,000 in March, 1949, according to the American Iron and Steel Institute.

Hudson Reports $2.2 Million Profit in First Quarter

Introduction of new Hudson models in February resulted in lower earnings than for the first quarter of 1949, but the company still reported a satisfactory profit for the first three months of this year. The company has reported a net profit of $2,248,000, compared with $2,178,000 for the preceding quarter and $3,678,000 for the first quarter of last year. A. E. Barit, president, told stockholders that during April three Hudson sales records were established and that field stocks are subnormal. He said that cars in the hands of dealers numbered 33 per cent less at the end of April than at the same date a year ago.

GM Signs Five-Year Contract With Union

Here are the high points of the GM-UAW agreement which covers wages, pensions, insurance, union security and which runs for five years. The contract may not be reopened by either party on any economic or contract issue before May 29, 1955. The cost-of-living formula established under the previous 1948 agreement is continued, plus an annual improvement factor of four cents an hour for the life of the contract starting May 29, 1950. Minimum pensions of $100 a month including Federal social security for all employes with 25 years of service with the added benefits that if Federal social security is increased pensions will exceed $100 a month for the majority of employes since GM's contribution will continue to be not less than $1.50 per month for each year of service up to 30 years. Normal retirement age is 65 with employes option to work until 68, and beyond 68 with company approval. The pension fund is to be trusteed, and the plan is funded on a 30-year basis with a joint company-union committee passing on eligibility. Employes totally and permanently disabled after age 50 and with at least 15 years' service receive disability pension until age 65 and then come under regular pensions. Life insurance increased $500 and sickness and accident weekly payments increased $14 in all brackets with no increase in premiums paid by employes. Life insurance ranges from $2500 to $5000 and sickness and accident benefits from $28 to $45.50 a week up to 26 weeks. A new feature is reimbursement to employes for doctors' visits in hospitals not to exceed $5 a day for a maximum of 70 days for each illness. GM also pays one-half the cost of hospital and surgical insurance for both employes and their families. Other features of the contract include improved vacation pay increases of five cents an hour in certain skilled classifications.

Rail Strike Settlement Averts Production Curb

Settlement of the rail strike came just in the nick of time to prevent serious interruption of production of cars and trucks. GM had started to feel the pinch at the Cleveland, Grand Rapids and Flint operations of Fisher Body,

PROPANE SPEEDSTER

Designed by L. J. Fageol, president, Twin Coach Co., who is shown here with Mrs. Fageol, this Supersonic Special has been operated on Propane for the past two years. Timed at 135 mph, it is equipped with a Fageol Twin Coach high compression (10 to 1 ratio) engine which develops 275 hp on Propane.

but production was not seriously curtailed by the short rail stoppage. However, if the strike had lasted a few more days, GM and other companies would have been forced to greatly reduce their output. It would have been particularly unfortunate for Chrysler, just snapping back after its long strike, although that company would have been in a little better position than its competitors because of large stockpiles of components built up during the strike and also because its operations are much more centralized. Immediately after the strike started, the company rushed preparations to substitute trucks for rail traffic wherever possible by converting rail loading docks to truck use and even building temporary roads across plant property.

With the strike settled and Chrysler and the rest of the industry reaching for new highs, May will undoubtedly break all previous records and June will show even more cars and trucks produced. There is a great deal of optimism in the industry about the number of vehicles that can be sold this year, but with May and June production certain to run between 700,000 and 800,000 units, it seems almost inevitable that dealer inventories will increase.

Chrysler Pays Vacation Allowance Early

Chrysler has made a concrete gesture of good will toward its employes by rushing payment of vacation allowances ahead of schedule in order to relieve the financial distress of its workers as an aftermath of the 99-day strike. The company has sent checks totaling $7.8 million for payment in lieu of vacations to 77,000 employes two weeks ahead of the due date. The action was entirely voluntary on the part of the company.

Army and Navy Announce New Contracts

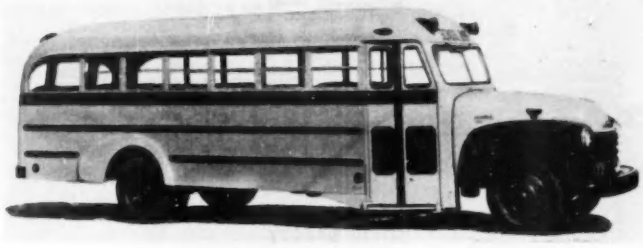
Automotive spare parts figured largely in recently announced Army contracts: GM's United Motors Service Div., $592,800, and $160,000; United States Rubber Co., $216,560; Chrysler Corp., $673,675; Camel Mfg. Co., Knoxville, Tenn., $517,058, and $271,450; Cuno Engineering Corp., Meriden, Conn., $118,658; and Vinco Corp., Detroit, Mich., $258,400. Contracts were also awarded to the Torrington Co., of South Bend, Ind., for $107,920 worth of roller bearings; Metro Engineering & Mfg. Co., Detroit, Mich., van bodies for trucks, $170,327; Willys-Overland Motors, Toledo, O., ¼-ton 4 x 4 trucks, and spare parts, $294,475; GM's Chevrolet Motor Div., 1½-ton, 4 x 2 trucks, $646,251, and personnel carrier vehicles, $1,619,682.

The Navy Dept. has awarded United Aircraft Corp. of East Hartford, Conn., some $51 million worth of contracts for the production of engines. Other contracts to the same firm call for supplying $2,668,000 worth of propeller assemblies. Polan Industries, Huntington, W. Va., has been awarded a Navy contract to process and repair some 3200 machine tools held in storage by the service. A fixed fee will be paid for the work which, together with estimated material cost, will approximate $477,500. In another Navy contract, the Engineering & Research Corp. of Hyattsville, Md., will supply 53 Aero 11A-1 tail turrets at a contract price of $737,852.

Buick Expanding Facilities for Dynaflow Production

With demand for its Dynaflow torque converter transmission on the increase, Buick has again begun an expansion program to increase production of the unit. Ivan L. Wiles, Buick general manager, and GM vice president, reports that the trend has been steadily upward running 80 per cent in April and orders indicating an increase to nearly 85 per cent in May. For all of 1949 more than 70 per cent of all Buick cars were equipped with Dynaflow and the percentage has increased so far this year even though total car production has far surpassed the 1949 level. Even on the Special series, Buick's lowest-priced car, more than 60 per cent were equipped with Dynaflow in April and 90 per cent of the Super models carried the unit which is standard on the Roadmaster series.

Buick in mid-May completed the first half million Dynaflow transmissions not quite two years and four months after the first unit was produced. Production is now running at the rate of 40,000 a month, but is still inadequate to meet the demand. However, output



SUPERIOR FOR 1950

Produced by the Superior Coach Corp., Lima, O., this new 1950 Pioneer school coach's interior is pressurized, with a centrally located unit for better heat distribution. A new windshield gives greater visibility. The center post has been reduced in size, yet its strength has been increased.

has increased rapidly in succeeding months from a 1360 daily top in January to a peak daily production of 1858 this month. By September, output will be up to nearly 2200 daily.

Retail Sales Records Continue to Fall

Reports continue to roll in showing new sales records for both GM and Ford and the independent automobile producers. Following are some of the reports: Packard retail deliveries in April up 18 per cent over the corresponding period of last year with dealer deliveries running 35 per cent ahead of factory production. Ford car and truck sales at a 20-year high for the first four months of this year with truck sales for that period at a new all-time record and at the second highest level in history for the month of April. Production for the first four months was at a 25-year high with assembly of 623,908 units. GMC Truck & Coach April sales highest in the division's history with 8495 trucks sold and production of 8925 units the highest, exclusive of military vehicles, for any April on record. Mercury April sales of 29,996 a new all-time record, and sales for the first four months of this year up 78.2 per cent over the same period of 1949.

Buick April sales topped the 50,000 mark for the second straight month, and for the first 10 days of May were 38 per cent greater than for any similar period on record. Buick has nearly reached its goal of 10 per cent of the industry total with preliminary figures for March showing 9.7 per cent penetration. Nash March-April sales of 40,889 cars at an all-time record for those two months exceeding the previous record 60-day period by 29.97 per cent. Hudson retail sales during April, 10 per cent ahead of the same month last year, 26 per cent higher than in March, and 50 per cent ahead of average monthly sales for the first three months of this year. The previous record for April sales was also broken this year. Chevrolet April retail sales of cars and trucks of 164,890 units was at an all-time peak, exceeding the previous record set in March despite two fewer selling days.

Leyland Introduces New Diesel Line

Leyland Motors Ltd., Leyland, England, has introduced a new range of bus and coach chassis, with the Diesel power unit mounted amidships below floor level, for the home and export markets. The new chassis are known as "Royal Tiger" models, and provide seating accommodation for 44 passengers on a single-deck bus. They are available in three different wheelbases. The models for the home market have a wheelbase of 15 ft, 7 in., suitable for an overall vehicle length length of 30 ft, and are available either 7 ft, 6 in. or 8 ft wide. These models can also be supplied for export with left-hand driving controls. In addition, there are export models with 17 ft, 6 in. and 20 ft, 4 in. wheelbases, all 8 ft wide and with left- or right-hand controls.

Nash Starts Operations at Canadian Plant

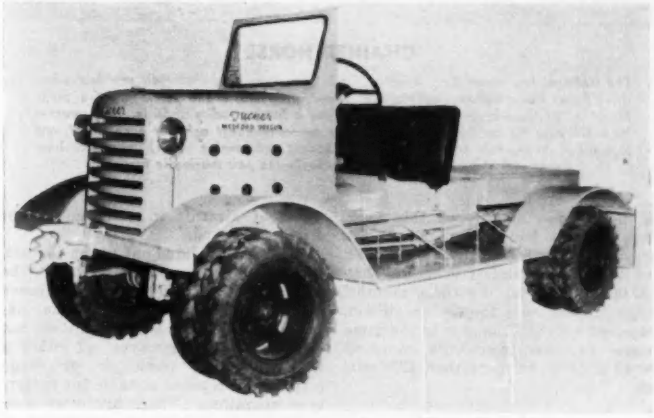
Nash will build about 2600 automobiles in Canada this year at its Toronto plant. Nash Motors of Canada, Ltd., opened the new assembly unit early in May, and expects to build about 1400 cars by Sept. 1. It is understood that the new Rambler model will not be put into production immediately but that the Rambler two-door sedan will be offered to Canadian buyers about the first of next year. Nash also expects to put the Rambler into production at its El Segundo, Calif., plant in July.

Italy Lowers Tariffs on Cars and Trucks

Signing by Italy of the tariff reduction agreement made at Annecy last year made the lower duties agreed upon effective as of May 30. Italy has lowered import duties on cars and trucks from 35 to 40 per cent, about 100 per cent cut from duties as of 1937. Tariffs have also been lowered by Italy on tractors as well as on all tires and tubes. American concessions to Italy were largely on agricultural products.

Chevrolet to Double Facilities for Powerglide Output

Some indication of the demand for automatic transmissions on lower-priced cars is seen in Chevrolet's announcement that production facilities for manufacturing the Chevrolet Powerglide will be doubled. By November expansion will be completed for the output of more than 2000 automatic transmissions a day at the Cleveland plant where the units are assembled. Currently production is running better than 1000 a day, and is falling far short of customer demands. The division can supply Powerglides for only about 25 per cent of its deluxe model schedules, and when the expanded facilities are completed it will be able to equip about 65 to 70 per cent of its deluxe models. Equipment and tooling have been ordered for the expansion of facilities in Cleveland, Flint, Detroit, Saginaw, Bay City, Buffalo and Toledo. Demand for Powerglide has far exceeded original expectations. An interesting point is that Chevrolet has generally followed a policy of making an item standard



TURNS FROM THE CENTER

For steering this new vehicle, produced by the Tucker Sno-Cat Corp., Medford, Ore., both front and rear axles pivot simultaneously from center on fifth wheels. An extra centerline axis for the front axle is said to allow any set of duals to drop or raise as much as 30 in. without interfering with the traction of the other three sets.

equipment when its demand as an option exceeds 50 per cent of production. By the end of this year, production of Powerglides will exceed 2000 a day, which is about 30 per cent of production.

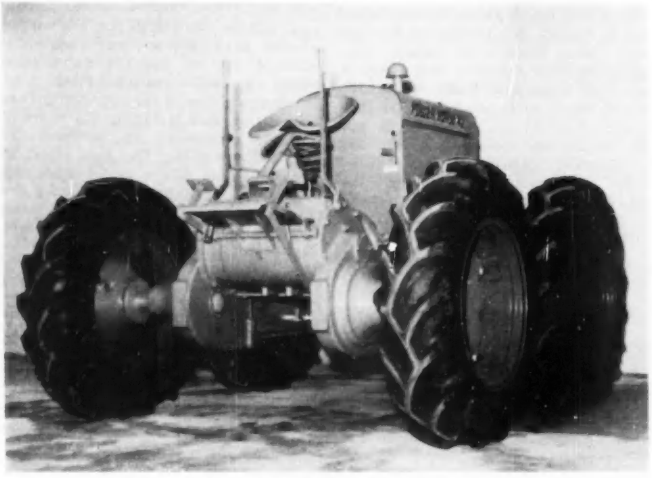
Packard Reports $259,586 Loss in First Quarter

As a result of lower dollar sales, increased provision for new tools, and continued cost of pioneering Ultramatic drive in volume production, Packard suffered a net loss of $259,586 for the first three months of this year. Since the loss includes an income tax carryback refund of $161,000, operating loss for the quarter was more than $420,000. Sales for the three months' period totaled more than $37.8 million, compared with $55.7 million in the same quarter of 1949, when the company earned a profit of more than $3.9 million.

Government May Test Planes in $12.5 Million Program

A Senate committee is weighing an Administration proposal that the Federal Government embark on a $12.5 million program of testing new types of planes developed by private industry. Several departments, including the Defense and Commerce Departments and the Civil Aeronautics Board, are urging such a five-year plan to develop three principal types of aircraft: jet passenger transports, large-capacity cargo planes, and small passenger transports for feeder lines. Thomas W. S. Davis, assistant secretary of Commerce, told the Senate Commerce Committee recently that it is "quite apparent today that without some assistance from the Federal Government, prototype development of the types of aircraft in question will be further delayed."

Mr. Davis pointed out to the committee that today, as in 1947 when the President's Air Policy Commission made its recommendations, the nation's aircraft industry still does not have "even the prototype" of either a turbine-powered passenger or cargo airplane, or a plane suitable for feeder-type operation. There are most compelling reasons from the standpoint of national defense for engaging in such a program as that proposed, Mr. Davis said, in addition to the "obvious benefits" which would accrue to civil aviation.



CHAINED HORSE

The National Implement Co., Stockton, Calif., has announced that their new four wheel drive Power Horse tractor, shown above, is now being built at the Harris Mfg. Co. plant, Stockton. With an overall length of 94 in., and a turning radius of 56 in., it is powered by a Chrysler six cyl 96-hp engine. It has an independent axle for each wheel, and high-speed, heavy-duty truck roller chains (housed and running in oil) unite each front wheel with the corresponding rear wheel—the pair moving in tandem.

Crosley Adapts Engine for Marine Use

Crosley Motors, Inc., is adapting its automobile engine for marine use. The company has announced that it will sell the marine engine equipped with reverse and reduction gear at $465 FOB, Cincinnati, making it the lowest priced four-cyl water-cooled marine engine ever offered. The power plant is suitable for boats of from 12 to 30 ft in length.

Car and Parts Makers' Profits Up 28 Per Cent in 1949

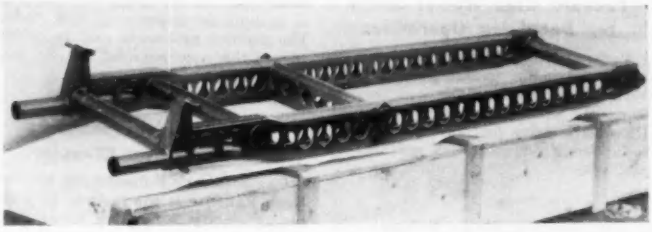
The motor vehicle and parts manufacturing industry was the only one to show a profit increase in 1949, up about 28 per cent over 1948, it is estimated by the Securities & Exchange Commission. Net income of all manufacturing corporations was estimated at $9 billion, a drop of 22 per cent from 1948.

Ford of Canada to Offer Automatic Transmission

Ford of Canada is planning to use the Ford-Mercury automatic transmission as optional equipment on its cars late this year or early in 1951. The automatic transmission developed by Ford and Borg-Warner cooperatively will be made available this summer to U. S. buyers first on Mercury cars and shortly thereafter on Fords as optional equipment. However, it now seems clear that the program has been delayed beyond the original starting date of June. Best estimates now indicate that the transmission will be available in late July or August.

SAE to Discuss Car and Engine Advances at Summer Meeting

At the Society of Automotive Engineers summer meeting, to be held at French Lick, Ind., from June 4 to 9, engineers will participate in round table discussions and symposia on detail improvements in motor vehicles and in engines of land and aircraft. The tentative program calls for prolonged discussion and exchange of engineering data on engine wear prevention, elimination of noise and vibration, improvement of riding comfort through changed seating arrangements and springing, designing of automatic transmissions, and correction of difficulties with ignition, cooling, and valve systems.



TWO ON A SIDE

The frame for the BMR racer, designed and produced by the British Motor Racing Research Trust (see page 54, Feb. 15th AUTOMOTIVE INDUSTRIES), shown here, weighs 127 lb, has four tubular crossmembers, 2½ to 3 in. diam, and two tubes per side member, 2½ in. diam. Distortion is said to be nil at pickup points. The car weighs 1344 lb dry, and 1900 lb on the starting line.

The meeting will feature the presentation of an engineering description of the new Ford-Mercury automatic transmission and a scientific evaluation of the relationship between fuel consumption and travel time for motor trucks.

Cost of Chrysler Strike Over $1.4 Billion

A recapitulation of the Chrysler strike settlement indicates once again how wasteful and costly strikes are as a means of settling wage and other labor disputes. It is estimated that the cost to Chrysler was about $1.4 billion involving the loss of production of more than 500,000 cars and trucks. Workers are estimated to have lost more than $900 each in wages which would require more than a year of overtime and Saturday work to make up. In addition, 50,000 employes of suppliers suffered loss of income estimated at $30 million. The unknown factor in the Chrysler strike is how much the union could have gained without taking strike action. Before the walkout started Chrysler had offered $100 monthly pensions but without a funding program. The union struck on the issue of funding of the pension and contributions by the company to insurance and other benefits. Chrysler, however, contended that it was willing to negotiate on all these matters when the strike was called. It is certainly difficult to see how the union won a very important victory as it claimed. For the workers who endured 99 days lost pay, it was a very costly strike.

MEWA Gives Show Policy and Names New Officers

The Motor and Equipment Wholesalers Association will conduct a Conference Booth Convention similar to those held last year and during the war, in Chicago, Dec. 3-5, 1951. The Association said that it is agreeable to holding the next following Automotive Service Industries Shows in 1952 and 1954, and that the MEWA does not have any present intention to conduct any kind of national or regional display shows, and it does not now contemplate holding any conference booth conventions in years in which ASI shows are held, but that the MEWA Board is not in a position to agree that the Association will not conduct conference booth conventions in off ASI show years.

The Board of Directors of the MEWA recently held their annual board meeting and elected officers for the new year which runs from May, 1950, to May, 1951, and also elected directors to succeed retiring board members. James C. Parker, president, Motor Parts & Supply Co., Inc., Mobile, Ala., who was vice president of the Association for the past year, succeeded John M. McClure, Minneapolis Iron Store, Minneapolis, Minn., as president. Harold E. Pirson, president, Pirson Auto Parts, North Tonawanda, N. Y., succeeds Mr. Parker as vice president. Floyd C. McLean, president, McLean Auto Supply Co., Laurinburg, N. C., succeeds Wm. D. Myers of Myers Motor Supply Co., Joplin, Mo., as secretary. Raymond W. Mellor, president, Mellor's Auto Parts, Providence, R. I., succeeds George E. Hull, Parks & Hull Automotive Corp., Baltimore, Md., as treasurer.

The following were elected to the board for a term of three years to succeed retiring directors: Hubert Braden, American Gear & Parts Co., Dallas, Tex.; W. D. Craig, Craig Motor Service Co., Inc., Fairmont, W. Va.; Ray Graff, Graff Motor Supply Co., Sioux Falls, S. D.; H. W. Hart, Hart Supply Co., Columbia, Miss.; A. S. Hatcher, Jr., A. S. Hatcher Co., Macon, Ga.; and S. B. Millen, John Millen & Son, Ltd., Montreal, Quebec, Canada. Other directors remaining on the board are:

INTERNATIONAL HEAVY

International Harvester Co.'s motor truck div. has announced this new heavy-duty model L-185 Roadliner with a GVW of 20,000 lb. Powered by the Super Red Diamond 372 engine developing 143.8 hp at 3200 rpm, the new model is available in several wheelbases. The new channel-type bumper is mounted directly to the frame.

John M. McClure, Minneapolis Iron Store, Minneapolis, Minn. (as immediate past president); A. Z. Heller, The York Supply Co., Dayton, O.; Edward M. Kelly, J. H. Kelly Co., Red Bank, N. J.; William D. Myers, Myers Motor Supply Co., Joplin, Mo.; C. A. Nudelman, Motor Car Supply Co., Seattle, Wash.; Warren T. Ruddell, Central Rubber & Supply Co., Indianapolis, Ind.; S. B. Sturtevant, Sturtevant's Auto Parts, Van Nuys, Calif.; and Harold U. Zerbe, E. S. Youse Co., Inc., Reading, Pa.

High Cost of Rubber to Boost Tire Prices

Increasingly strong hints come from the rubber industry of an impending boost in passenger car tire prices. The price of crude rubber has been going up steadily since last year, and while part of the increased price can be offset by the greater use of synthetic rubber in passenger car tires it may not be enough to forestall a price boost. Tire prices have increased only six per cent since before the war, leaving manufacturers a very narrow margin to work on.

Packard Uses Walnut Shells for Deburring Operations

Packard has joined the ranks of manufacturers using walnut shells for deburring operations. The company is using the process in production of its Ultramatic drive for blasting tiny metallic burrs off machined surfaces of castings.

Chrysler Strike Brings Large Loss to Briggs

Briggs Manufacturing Co. has reported a net loss of $860,172 for the first quarter of this year. The loss was a direct result of the Chrysler strike. In the corresponding quarter of 1949 Briggs earned more than $465,000.

Chrysler Interested in Plastic Die Process

Reports from Detroit say that Chrysler is interested in the plastic die making process used by Kaiser-Frazer in developing dies for its lower-priced automobile, the Henry J. Strength is added to the reports by information from tool and die shops that Chrysler is pushing development of new models. The plastics process is said to greatly reduce the time required for die making.

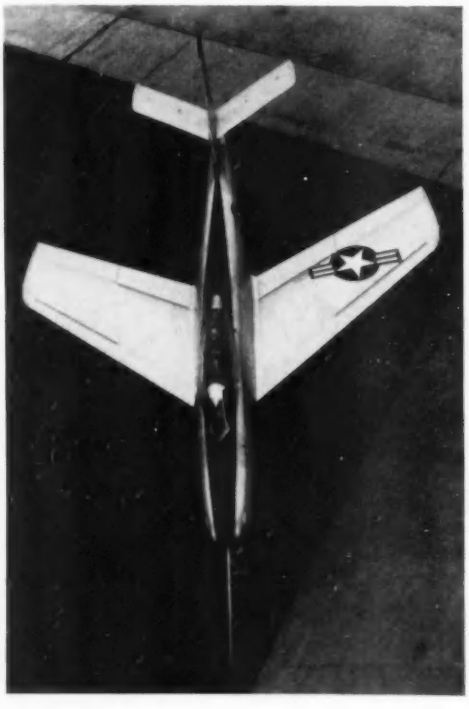
Nash Rambler Upholstery Removable for Cleaning

One interesting feature of the new Nash Rambler is the manner in which the upholstery is fastened to seats and seat backs. Through an ingenious arrangement, Nash has devised a way of attaching the material with a series of hooks which loop over a rod in the seat springs and over a concealed supporting rod in the case of seat backs. When upholstery needs to be cleaned it can be removed easily for dry cleaning or washing in much the same manner as seat covers.

ASTE to Hold 1952 Exposition in Chicago

Scheduled for the week of March 17, 1952, the 1952 Industrial Exposition of the American Society of Tool Engineers will be held at the Chicago Amphitheatre.

The society reports that already a large number of space reservations are coming in for the 1952 show with early reservations being given top priority numbers for selection of exhibit space when floor plans are available. The 1950 show in April in Philadelphia drew an estimated audience of over 68,000 persons with actual registrations exceeding 18,000.



SHARPLY SWEPT

Now being tested by the USAF, this new swept-wing jet fighter, the Republic Aviation Corp.'s YF-96A, is powered by a later version of the Allison J-35 turbo-jet engine with a dry static thrust rating of 5200 lb. The approximate dimensions for the new aircraft are: wingspan 34 ft; length, 38 ft; and height, 14 ft. It is designed for a maximum gross take-off weight of about 25,000 lb.

Factories Note Increase in Customer Driveaway

Automobile manufacturers report that the number of persons wanting to take delivery of their new cars at the factory is on the increase. The demand for factory delivery is creating something of a problem for some companies that do not have adequate facilities to take care of preparation and servicing a large number of vehicles each day for customer driveaway. Hudson reports that it is expanding its customer delivery facilities greatly to meet the demand from an increasing number of customers who are prompted by savings in transportation to make a trip to Detroit and pick up the car themselves.

Chrysler Reported Planning 4000 Acre Proving Ground

Well founded reports in Detroit state that the Chrysler Corp. is negotiating

for the purchase for about $750,000 of a 4000-acre site about 40 miles west of Detroit for a proving ground. Chrysler has neither confirmed nor denied the report, but it is considered highly probable that the reports are accurate.

Dodge Changes Specs on Summer Use Oil

Dodge Div. of Chrysler Corp. has revised its recommendations of engine oil specifications for summer driving. For several years the company has recommended SAE 20 or 20-W oil for new cars operating at temperatures of above 32 F; however, 1950 instruction manuals recommend SAE 30 oil for that temperature range. The change was made after several years of engineering tests which indicate that the heavier bodied oil is a more stable product which favors reduction in engine wear. The advantages of using the heavier oil, according to Dodge, offset the slight gain in gasoline economy which may be achieved with lighter oils.

Fiat Gets $3.5 Million More from ECA

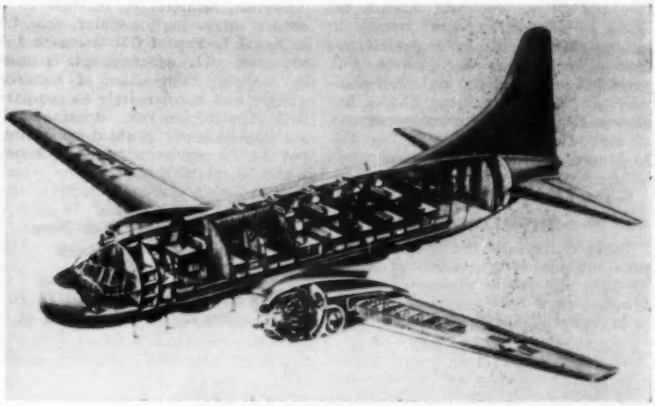
An additional $3.5 million in Marshall Plan funds have been made available to the Fiat company of Italy with which it will complete the second half of its program for modernizing its steel mills. When completed, Fiat will have spent $25 million on improvement of steel facilities with a total of about $8 million in ECA aid.

Purolator Products Now In Rahway, New Jersey

The Purolator Products, Inc.'s, general offices and manufacturing operations are now located in the new plant at Rahway, N. J. Formerly located in Newark, the company announced acquisition of the larger plant in Rahway, and plans for consolidation of its operations there some time ago.

Buick Installs Electronic System to Control Car Orders

Buick has installed a new electronic system for sorting and controlling new car orders. The company claims that adaptation of the card system is the only one of its kind in the industry. It is equipped to handle 6000 specification cards an hour with 60 calculations possible on each card. In the 1950 Buick line the total of all possible combination is well over 14,000, including models, colors, upholstery combinations, and 21 different accessories. Production of the car is controlled by the card system.



TRAINS IN GROUPS

The interior arrangement of the Consolidated Vultee Aircraft Corp.'s T-29, based on the 40-passenger Convair-Liner transport and used for training navigators in groups by the USAF is shown here. Opposite the main entrance (which is starboard and forward of the wing) is the radio operator's station, and aft of the front compartment is the radar training section. The main cabin includes standard navigation training equipment and stations for 10 students. Four astrodomes on top of the fuselage are provided for taking sextant sights.

Drop in Retail Automobile Inventories in March

Retail inventories of motor vehicles alone showed a decline for March, according to the Office of Business Economics. All others increased while manufacturers' stocks remained unchanged. Total business inventories as of April 1 were estimated at $55 billion, an increase of a half-billion above February.

K-F Names Rickert Service Manager

Kaiser-Frazer has appointed E. N. Rickert as general service manager. He succeeds Clarke A. Silcott, who has been appointed western sales manager. In his new post Mr. Rickert will direct the expansion of the K-F field sales forces.

Machine Tool Builders Set Up Export Group

A number of machine tool builders have formed an export marketing group called the Machine Affiliates Trading Corp. The 17 members involved have concluded an agreement with the Export-Import Bank for extended payments to machine tool buyers in Central and South America, Mexico, and the Carribean area with terms running up to 18 months on balances up to 25 per cent. The group will provide a $1.5 million revaluing fund to guarantee against any losses to the bank.

C. S. Ferguson Joins Bendix as Technical Director

C. Stewart Ferguson has been appointed technical director of the Marshall Eclipse Div. of Bendix Aviation Corp. He had formerly been associated with General Electric for 31 years as chemist, engineer and executive. In his new post at Bendix, he will be responsible for developing new heat and wear resisting brake lining materials and also will direct the company's production and research program.

Body Engineers to Meet in Detroit, Nov. 1-3

The American Society of Body Engineers will hold the Fifth Annual Technical Convention in Detroit, Mich., on Nov. 1-3. There will be eight technical sessions directed by outstanding speakers and engineers in the automo-

tive industries, who will discuss the latest developments and trends in automobile body styling, materials and production engineering. Lynn A. Fill, president of the ASBE and chief engineer of Motor Products Corp., has chosen Charles Y. Cheriez, supervisor of styling of Hudson Motor Car Co., as general chairman of the convention.

Chesebrough Made Assistant to Chrysler Body Chief

Harry E. Chesebrough has been made assistant chief body engineer of Chrysler Corp. He will be assistant to U. L. Thomas, chief body engineer, and will be in charge of the administrative functions of the car body sections. He had previously been chief resident engineer of the Dodge Div. and will be succeeded in that post by B. W. Bogan, previously supervising experimental engineer in charge of general and experimental test operations on passenger cars.

Ray Johnson Made Aide to B-W President

Ray P. Johnson has been elected administrative assistant to Roy C. Ingersoll, new president of Borg-Warner Corp. He is also a member of the B-W board of directors and first vice president of Morse Chain Co., a B-W division.

Spectrograph Gaining for Quick Analyses

Spectrograph analysis for quick semi-qualitive analysis of industrial materials, samples, or residues is becoming increasingly popular, according to David L. Fry of GM Research Laboratories. The spectrograph is useful in checking composition of materials quickly and inexpensively as compared with chemical analysis. Routine analyses may be made in about six minutes but it may require a period of several weeks to set up the method.

K-F Appoints Two New Members of Board

Kaiser-Frazer has announced the election of Sheldon R. Coons, New York business consultant to its board of directors. Also elected to the board was Webb Wilson, New York financial executive, who recently joined the company as treasurer.

Acme

MIDGET ITALIAN

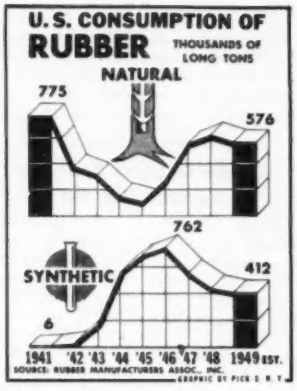
Weighing about 1100 lb, this Italian helicopter, the B.G.M. 2, is said to be one of the smallest in the world. Powered by a four-cyl 80-hp engine, it has a maximum range of 400 miles. Constructed by Frederico Brondetti, an Italian engineer, it is currently being demonstrated for the first time.

U. S. Exported 48,000 Vehicles in First Quarter of 1950

The United States exported 24,423 trucks and buses, 23,634 passenger cars, and $57.5 million worth of automotive parts during the first quarter of 1950, the Census Bureau reports. Nearly half, or $25.4 million worth of the parts were for assembly abroad.

Canadian Aviation Industry Hit by Unemployment

Widespread unemployment has hit Canada's aviation industry just when five years' research promised results. In one year, the industry's labor force has been reduced to almost half, a



situation which some manufacturers say, threatens national security. The biggest layoff has just ended at Canadair Ltd. of Montreal, largest Canadian manufacturer, where employment is down from 5800 to 3300 persons.

Indecision in the placement of government contracts is blamed by some plane builders, who say that they can no longer live on promises.

Reportedly suffering from widespread lack of business are firms who helped Canada throw 16,000 of her own aircraft into World War II. "Our national payroll for 1948 in the industry was nearly $20 million," said one firm's executive. "This year it will be down to about $10 million."

The case of Avro Canada in Toronto illustrates the odd position. Makers of three jet products, a fighter, transport and engine, they have still had to lay off workers doing "bread-and-butter" jobs. Even while the company's newest equipment was getting public acclaim, 200 persons received notices in recent weeks. Other companies suffering severe cuts in business include De Haviland of Canada at Toronto, Northwest Industries of Edmonton, Macdonald Bros. Aircraft Ltd. of Winnipeg, Canadian Car and Foundry at Montreal, and the Cub Aircraft Corp. in Hamilton.

U. S. Car Makers Participate In German Show

Berlin's first postwar International Automobile Show, held May 27 to June 4, was highlighted by models exhibited by leading American manufacturers, State Department officials said. Ford, General Motors, Chrysler, Nash, Hudson, Kaiser-Frazer, Studebaker, and Willys, all displayed their products, and the firms sent factory experts along to answer questions ranging from technical problems to working conditions in American factories.

Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers.

Ford Motor Co.—The appointment of **Beach Williamson** as controller of the dealer development office, has been announced.

Ford Motor Co.—**William R. Loughran** has been appointed General Purchasing Agent of the Ford International.

Kaiser-Frazer Corp.—**Earl D. Studer** has been appointed administrative manager of the K-F Sales Dept. The appointment of **E. N. Rickert** as general service manager has also been announced.

The White Motor Co. — The announcement of the promotion of four executives of the company has been made, as follows: **Edward S. Reddig** was elected Vice-President, Finance; **George T. Zack**, Controller; **Harold O. Hoffman**, Treasurer, and **John O. Hornick**, Asst. Treasurer. **Robert C. Lee** continues as Vice-President.

Borg-Warner Corp. — The appointment of **Ray P. Johnson** as Administrative Asst. to **Roy C. Ingersoll**, the newly elected President, has been announced.

Westinghouse Electric Corp. — According to a recent announcement, two of the company's key officials have exchanged positions. Vice-President **W. O. Lippman**, formerly in charge of Plant Labor Relations, is now head of the Elevator Div. at Jersey City. Vice-President **Tom Turner** has taken charge of Plant Labor Relations, with headquarters in Pittsburgh.

American Steel & Wire Co.—**Albert P. Hayden** has become superintendent of wire rope and tramway engineering and **John A. Herr** has advanced to the position of assistant supt. of the department.

Heli-Coil Corp.—**C. Elmer Gishel** has been appointed Sales Promotion Manager.

Automatic Steel Products, Inc.—The election of **H. O. Holland** as Vice-President in charge of Sales of all divisions of the corporation, has been announced.

Scott Aviation Corp.—**L. E. Jordan** has been appointed to the newly created post of General Sales Manager.

Sun Oil Co.—**Hubert S. Mount** has been appointed manager of the company's Sales Engineering Dept. Mr. Mount succeeds **William A. Courtenay, Jr.**, who has retired.

Doehler-Jarvis Corp.—The promotion of **Thomas A. Hammer, Jr.**, to the post of Asst. Treasurer and **Irving R. Warshow** to the post of Asst. Controller, has been announced.

Raybestos-Manhattan, Inc. — **George R. Weber** was elected Treasurer of the company, succeeding **W. H. Dunn**, who has retired. **W. S. Simpson** was elected Secretary and **W. Ward Kievit** a Director.

General Electric Co. — **Thomas Sproule** has been appointed Asst Manager of Manufacturing for the Fitchburg Turbine and Welding Div. **G. S. Berge** has been appointed sales development supervisor for silicone rubber and **J. A. Buckley** has been appointed to the same position for extruded plastics products.

Fairchild Engine & Airplane Corp.—The promotion of **A. Paul Fonda** from the Sales Dept. of the Fairchild Aircraft Div. to the Customer Relations staff of the Fairchild Engine & Airplane Corp., has been announced.

The Lake City Malleable Co.—The appointment of **Walter S. Howard** as Director of Engineering and Development of automotive and high strength malleable castings has been announced.

Thomas A. Edison, Inc.—**Charles Edison**, President, was elected to the newly created position of Chairman of the Board of Directors, and **Henry G. Riter, 3rd**, was elected to succeed Mr. Edison as President.

Twin Coach Co.—The following new directors have been elected: **J. D. Burge**, of Ball, Burge and Kraus, and **C. W. Enyart**, of C. L. Gougler Machine Co.

Twin Coach Co.—**Earl H. Lenz** has been named Vice-President in charge of bus production in both Kent, O., and Ft. Erie, Ontario. **William G. Ritzer** has been named Comptroller and Assistant Treasurer of the company.

The B. F. Goodrich Co.—**Elliott R. McKee** has been made Managing Director of the N. V. Nederlanse B. F. Goodrich Co., with headquarters in The Hague, Holland.

Cutting Tool Mfrs. Assoc.—The appointment of **Martin Ewald** as Executive Secretary of the association has

(*Turn to Page 74, please*)

CALENDAR

OF COMING SHOWS AND MEETINGS

Conventions and Meetings

International Trade Fair, Toronto ..... May 29-June 9

Amer. Society for Quality Control, Fifth Midwest Conference-Annual Convention, Milwaukee, Wis. ..... June 1-2

Amer. Gear Mfrs. Assoc., Hot Springs, Va. ..... June 4-7

SAE Summer Mtg., French Lick ..... June 4-9

Amer. Electroplaters' Soc. Convention, Boston ..... June 12-16

Amer. Soc. Mech. Engineers, Nat'l Mtg., Chicago ..... June 12-16

Nat'l Truck, Trailer & Equip. Show, Los Angeles ..... June 22-25

A.S.T.M. Annual Mtg., Atlantic City ..... June 26-30

International Trade Fair, Chicago ..... Aug. 7-19

SAE Nat'l West Coast Mtg., Los Angeles ..... Aug. 14-16

SAE Tractor Mtg., Milwaukee ..... Sept. 11

Nat'l Assoc. Motor Bus Operators Annual Mtg., Chicago ..... Sept. 13-15

Instrument Soc. of Amer. Conf. & Exhibit, Buffalo ..... Sept. 18-22

SAE Nat'l Transportation Mtg., New York City ..... Oct. 16-18

Nat'l Safety Congress, Chicago ..... Oct. 16-20

Society of the Plastics Industry Nat'l Conference, Swampscott, Mass. ..... Oct. 18-20

Amer. Society for Metals' Annual Nat'l Metal Congress & Exhibition, Chicago ..... Oct. 23-27

Amer. Welding Soc. Annual Mtg., Chicago ..... Oct. 23-27

Nat'l Lub. Grease Inst., Chicago ..... Oct. 30-Nov. 1

Amer. Soc. Body Engrs. Technical Convention, Detroit ..... Nov. 1-3

Soc. of Plastic Engrs., New York City ..... Jan. 18-20

Amer. Soc. Tool Engrs., New York City ..... Mar. 17

Necrology

W. G. Robbins, 48, president, Carboloy Co., Detroit, died on May 18 in Schenectady, N. Y.

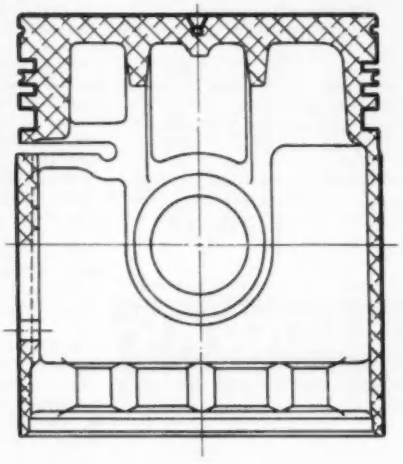
David Marvin Goodrich, 73, honorary chairman of the board, B. F. Goodrich Co., Akron, O., died on May 17 in Mount Kisco, N. Y.

Frank Bernard Killian, 67, retired chief automotive engineer, foreign trade dept., Socony-Vacuum Oil Co., Inc., died in Bellport, L. I., N. Y., on May 20.

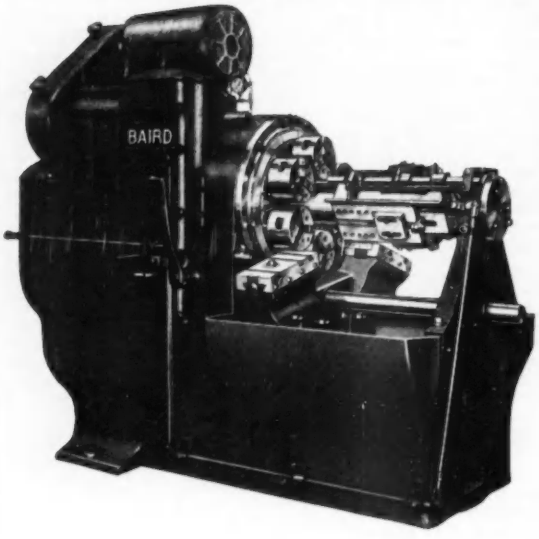
Elliptical TURNING

The mechanical drawing opposite is of a 3 5/16" by 3¾" long aluminum alloy piston. It was held in a mechanically operated expanding pin type chuck and centered on a previously finished land, inside the skirt of the piston.

The piston was rough and finish turned at the skirt end; elliptical O.D.; DOME and 5 grooves and dome centered and grooves chamfered.



243 per hour



BAIRD
No. 76H *Automatic* CHUCKER

Some Exclusive Features:

- **INDEPENDENT TOOL SLIDES**
  The longitudinal tool slides may have different strokes and the cross slides are independent and have their strokes, all as best suits the job. All tool slides have micrometer adjustment.
- **DIFFERENT SPEEDS AT SPINDLES**
  Ability to choose a speed for the spindle at each work station to suit the operation to be performed at that station permits the best product in least time.
- **AUTOMATIC CHUCKING**
  Operator has both hands free to handle the work. No levers or handles to require his attention or take his time.
- **ATTACHMENTS**
  Several readily applied attachments are available to perform extra operations and reduce handling, thus speeding production.
- **AUTOMATIC MECHANICAL STOP**
  Stops machine at end of each cycle if operator has not unloaded and reloaded in the proper operation of machine. This and other safety features make for least loss due to damage and for greatest safety.

"ASK BAIRD ABOUT IT"

OTHER BAIRD MACHINES: MULTIPLE SPINDLE GRINDERS, WIRE FORMING MACHINES, PRESSES, TUMBLING EQUIPMENT

THE BAIRD MACHINE COMPANY
STRATFORD, CONN.

The Sharpest Pencils Specify *"Double Diamonds"*

WE LIKE GEAR BUYERS with sharp pencils. *Really* sharp ones. They're the ones who know that cutting cost with their "Double Diamond" Gears is more than a matter of just whittling at price.

They know, too, that "Double Diamond" Gears conform with undeviating uniformity to customers' rigid specifications. That means *installed cost* is lower—thanks to close observance of manufacturing tolerances. It means, as our old customers can attest, a long life remarkably free of *servicing expense*. It means value almost beyond price expressed in the reputation, performance and salability of their own products.

Isn't that for you?

We'll furnish you with gears as completely dependable as 36 years of gear-making integrity can make them—then you compare for yourself the true value of final cost against the possible false economies of initial cost only. Your inquiry will receive prompt attention, by mail or in person, as you prefer.

DOUBLE DIAMOND
TRADE MARK
GEARS

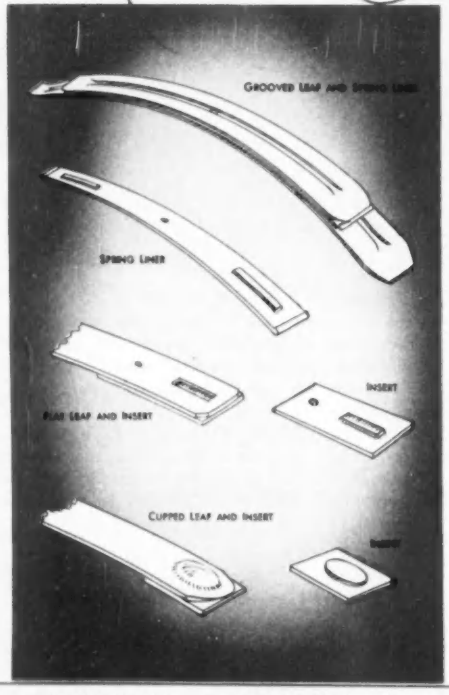
Automotive Gear Works, Inc.
RICHMOND, INDIANA

• • • • • • FOR AUTOMOTIVE FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS • • • •

*Reg. U. S. Pat. Off.

HYPOID BEVEL · SPIRAL BEVEL · FLYWHEEL GEAR · ZEROL* BEVEL · STRAIGHT BEVEL · STRAIGHT SPUR · HELICAL SPUR · SPLINE SHAFT

Like riding on a Cloud



DEE-GEE
INTER LEAF SPRING LINERS
ARE STANDARD EQUIPMENT
ON
AMERICA'S FINEST CARS

- ★ CUSHION THE RIDE
- ★ CONTROL SPRING ACTION
- ★ PROVIDE PERMANENT LUBRICATION
- ★ ELIMINATE SPRING COVERS
- ★ ELIMINATE SPRING SQUEAKS

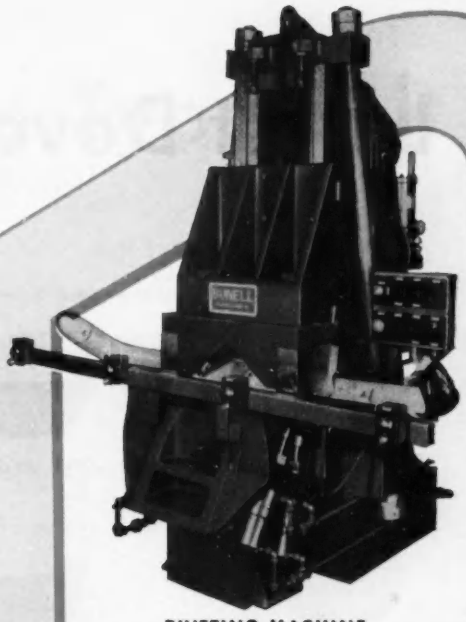
DETROIT GASKET & MANUFACTURING COMPANY

DETROIT 23, MICHIGAN

more parts for less dollars with bunell

SPECIAL MACHINES

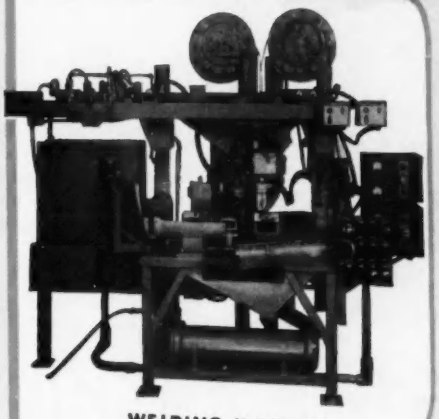
RIVETING MACHINE. This Bunell Special Machine completes 300 automobile bumper face bars an hour, riveting the center face bar section to the two outer sections. The three sections are automatically positioned by the ram, which acts as a back-up for the rivets. Three hydraulic riveting hammers on each side cold squeeze the heads on six rivets simultaneously. Operation is completely automatic . . . or separate machine functions can be controlled individually.



RIVETING MACHINE

● **You can drop your unit costs to rock-bottom levels with Bunell Special Machines—ruggedly built for accurate, efficient operation. Our competent engineering staff, skilled personnel, and modern, complete plant are at your service. Let us help with your production problems. Write today!**

WELDING MACHINE. One supporting clip is welded to each right and left hand automobile bumper face bar section by this Bunell Special Machine—which produces 300 pieces an hour. Automatic welding heads weld two sides of the clip to the face bar. While one section and clip are being welded, the opposite section and clip are loaded, so that operation can be continuous. Operation of each side of the machine is completely automatic. A flux recovery unit is included.



WELDING MACHINE

WRITE FOR CATALOG describing BUNELL facilities, methods and equipment.

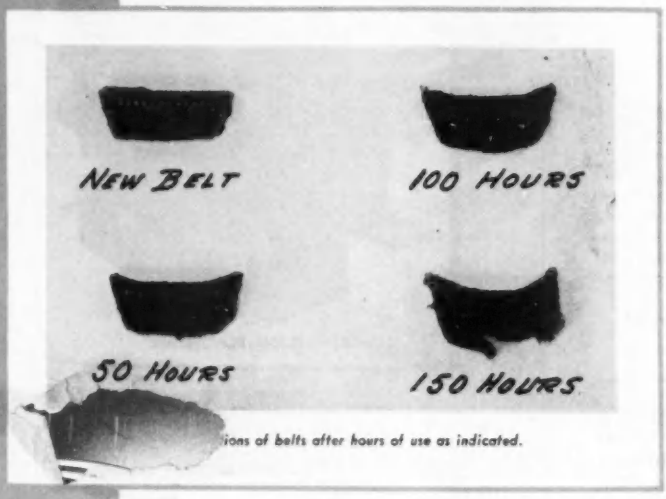
THE BUNELL MACHINE & TOOL CO. BUNELL CLEVELAND, O.

BUNELL MACHINE AND TOOL CO.

1601 EAST 23rd STREET • CLEVELAND 14, OHIO

Since 1920, Designers and Builders of Special Tools, Dies, Jigs, Fixtures and Special Machines

Latest Development of



...ions of belts after hours of use as indicated.

By Gordon I. McNeil
Goodyear Tire & Rubber Co.

DURING the war most of the vehicles manufactured were trucks, tanks or vehicles of a military nature, the accessories for which consumed a sizable amount of power. By necessity steel cable belts were required to satisfactorily transmit the power and service rendered became more important than cost involved. For this reason steel cable belts became more prominent during this period than at any time up to the start of the war. While much could be said about early developments which ultimately brought about the final design of wedge type belt, space at this time does not permit.

Steel cable belts, however, definitely pointed the way for what is believed to be the latest and best development in V-belt design today. It became apparent with increased operating tension, which by necessity required a steel cable as a tension member, that the belt had a tendency to bow in the pulley as shown in Fig. 1.

Fig. 1—This illustration shows tendency of the belt to bow in the pulley when operating tension is increased.

It can be observed (Fig. 1) that the cables closest to the sides of the belt are traveling through a greater circumference than the cables in the center of the belt. This constant moving the cables in the belt tends to increase the internal friction which in turn generates heat which ultimately causes failure of the belt. Actual tests verify this theory as indicated in Fig. 2, which shows sections of belts which have operated a different number of hours. It will be observed that as the hours increased the tendency of the belt to have a permanent bow was also increased. This was more appar-

the Wedge Type Belt

ent while the belt was operating in the pulley than after it was removed, at which time it returned to its normal position. It can be seen that ultimate failure of the belt took place at 150 hours, this starting in a vertical shear line from the lower right hand corner of the belt.

Shear failure is usually corrected by making the belt thicker. Thick belts, however, fail usually from excessive heat. In order to eliminate heat failure, belts are made somewhat wider and thinner which helps reduce unit loads. To complete this cycle of "thicker-

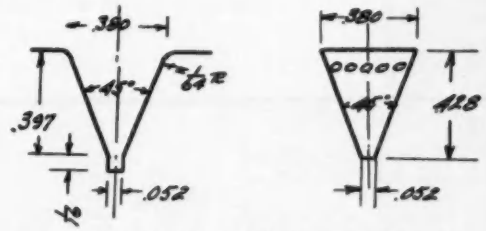


Fig. 3—Original belt section and pulley groove as first used on Kaiser-Frazer engines.

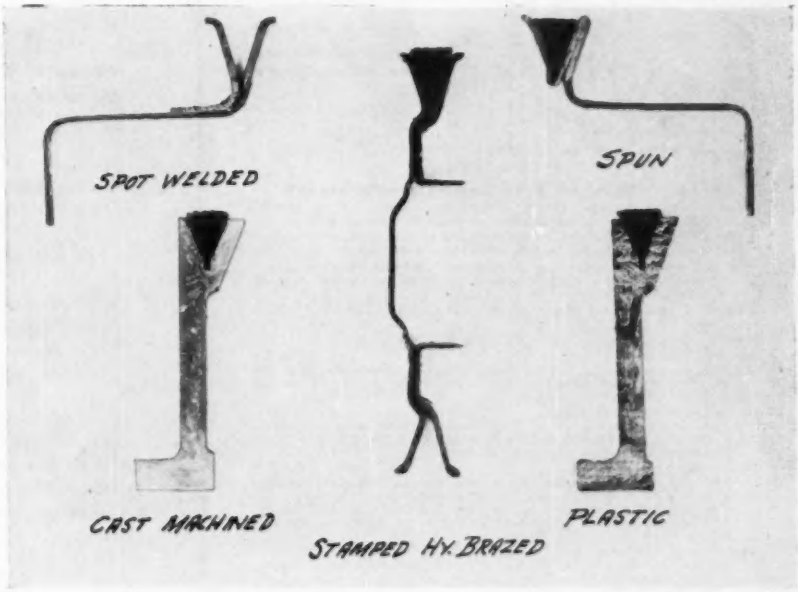


Fig. 4—Types of wedge pulleys.

Latest Development of the Wedge Type Belt

thinner-wider," it usually took several years. In order to prevent the cycle from reoccurring, it was decided to reverse the thinking and remove material from the belt instead of adding it. This was accomplished by first throwing the center of the belt away and using only the two sides as shown in Fig. 1. First tests on the new type of belt indicated a considerable increase in life and a considerable reduction in internal temperature.

The first application in practical service was on Kaiser-Frazer models. These first cars used a 45 deg pulley with a 45 deg belt. Early tests showed a slight interference between the bottom of the belt and the pulley. This was corrected immediately by having a slight differential in angle between belt and pulley. It has always been standard practice in V-belt design to have a differential in belt and pulley angle but it was thought because of the large amount of flexibility of this new type of belt, it was not necessary. The original belt section and pulley groove are shown in Fig. 3. Further tests on the new combination indicated that it required no more tension to operate the wedge type belt than the standard trapezoidal type of same angle.

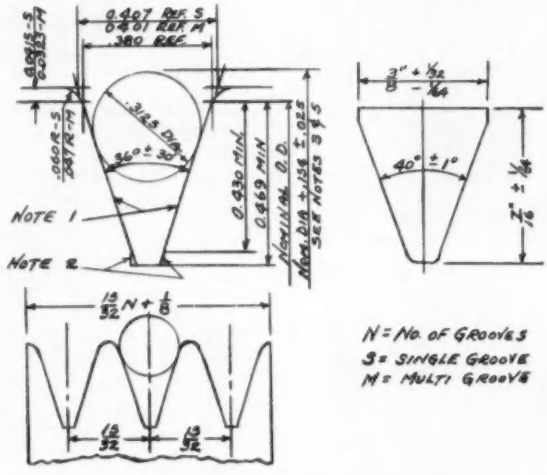


Fig. 5—Standard belt and pulley dimensions for wedge type belts.

Note 1. These surfaces must be smooth. Runout not to exceed 0/.010 in. total indicator reading normal to sides of groove.

Note 2. Contour between arrows optional to suit method of manufacture, but must not extend inside the solid lines.

Note 3. Maximum variation from groove to groove in multiple grooved pulleys shall not exceed 0.005 in. on diameter over balls or plugs, in the same pulley.

Note 4. Center line of groove must be 90 deg ± 1 deg with pulley axis.

Note 5. Future anticipated revision ± 0.015 in.

Nominal Lengths
The wedge is made in 1 in. incremepts on outside length using the even inch as the nominal size, i.e., 41 in., 47 in., 56 in., up to 60 in.: 2 in. steps above 60 in.

Nominal Length Tolerances
The length tolerance is ± 1/8 in. on centers for wedge belts up to 50 in. outside length and ± 3/16 in. for belts 50 in. to 60 in. outside length, ± 1/4 in. above 60 in.

Measuring
Measure wedge belts on two equal diameter standard groove pulleys with a total tension of 60 lb divided equally between the 2 belt strands. Length is 2 x center + nominal circumference of 1 pulley. Pulleys 4.775 in. nom dia have 15.000 in. circumference.

Matching
Wedge belts will be matched to a total tolerance of 1/32 in. on centers when measured in standard grooves for any drives using multiple belts.

Cogging
All belts will be cogged.

In general there are three factors which have to be considered in the operation of a belt drive if it is to perform satisfactorily:

(1) Tension of the belt system.

(2) Angle of contact in the belt and the individual pulleys in the system.

(3) The effectiveness of the coefficient of friction of the belt pulley combination (this will vary depending on the selected angle of pulley).

In order to give satisfactory operation, the belt system must be in balance at all times. If the tension

(*Turn to page* 80, *please*)

Recent Applications of

Versatile Hydraulic Presses

FOR many years, Young Radiator Co., manufacturer of heat transfer products, provided radiators with cast frames and tanks to makers of equipment in the power unit, earth moving, industrial, and automotive fields. Developmental work, however, was carried on to produce a radiator that would stand extreme shock. It was finally decided to make the frame, casing, sides, top and lower tanks of steel plate, pressed and formed into shape, which gave a lighter, stronger, and more

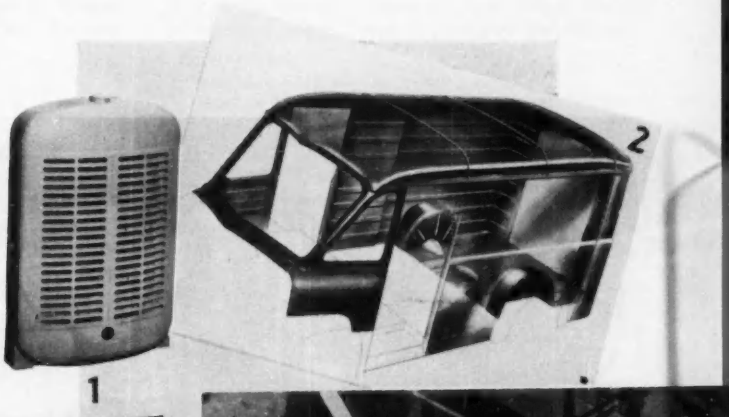
(*Turn to page 60, please*)

1. Manufactured by Young Radiator Co., this radiator assembly, which is lighter and stronger than the model previously produced, uses pressed steel for tanks and shell. It is designed for engine cooling on portable compressor units and packaged power units.

2. Phanton view of assembled truck parts produced for one of the Big Three manufacturers by Charles T. Brandt, Inc.

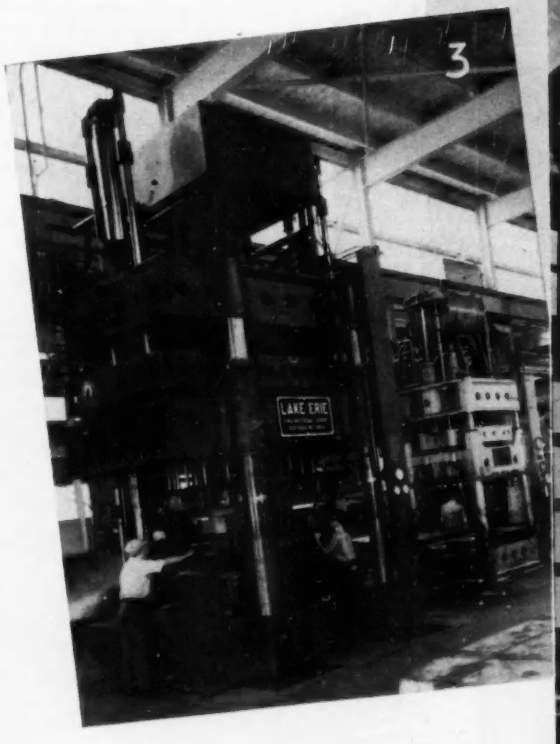
3. These two Lake Erie Engineering Corp. double-action hydraulic presses, rated at 800-tons for the press on the left and 407-tons for the one on the right, are the first units in the main Brandt production line.

4. The E. W. Bliss Co. single-action hydraulic press, shown here, was designed for use in the Young plant. It has a specially made spacer with T slots, and can operate at either 175-tons pressure or at full load of 450-tons.

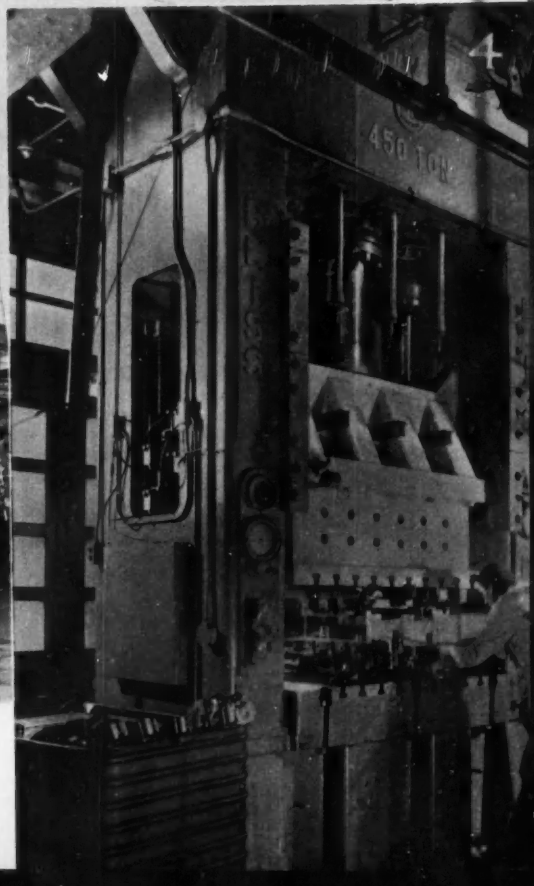


1

2



3

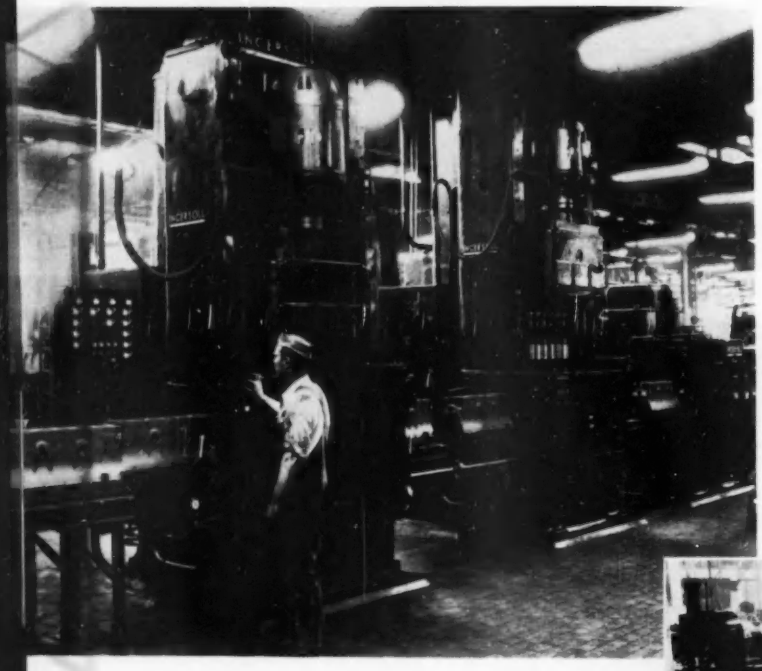


4

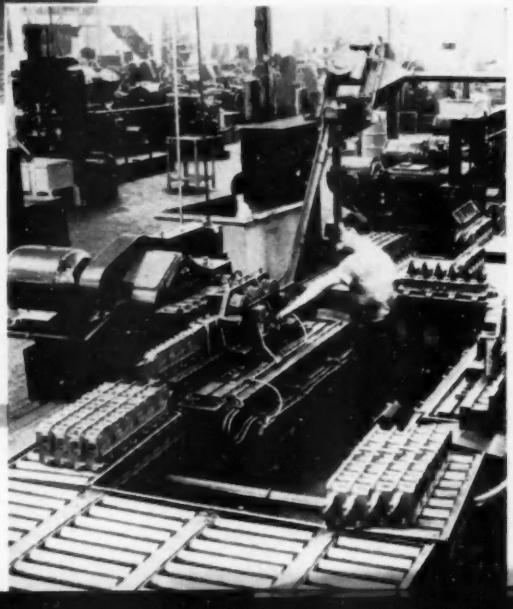
IHC Adopts Newest Type

IN planning the manufacture of the Silver Diamond engine at International Harvester's Indianapolis, Ind., truck engine plant, much research was done to select the best and most modern equipment for the job. This new Silver Diamond is the engine used to power International trucks from the half-ton pick-up model to the L-160 model which will carry a load of almost six tons, including the weight of the truck body. As a result of this research, much of the new equipment is of the transfer type which minimizes the amount of manual material handling along the machining lines. Emphasis on sturdy and accurate machine and fixture construction was the program keynote in order to assure sufficient overload safety factors for long range quality in the product. Most of the transfer equipment, which automatically moves the part being processed from station to station, is used on the cylinder block and cylinder head machining lines.

Each transfer machine is equipped with mechanical and electrical interlocks that assure proper location and clamping of the parts being processed before the automatic operation cycle is started at each station. Each machine has an electrical control panel with lights that indicate whether all parts are properly located



(Above) This Ingersoll four-unit transfer machine rough bores the cylinders; chamfers top and bottom of cylinder bores; and mills side clearances on bearing bridges, locating notches for bearing shells, and all miscellaneous pads on the side of the cylinder block



(Right) Cylinder head combustion chambers are machined in the two Cincinnati profile mills seen in the foreground before the heads go to the Natco transfer drilling machines. Holes in the top and bottom of the heads are drilled, chamfered and tapped, and rough valve seating operations are performed in the Natco unit

Transfer Machines

for Truck Engine Production

By Joseph Olender

Mechanical Engineer,
Indianapolis Truck Engine Works,
International Harvester Co.

and all of the several stations are cycling correctly.

Helping the efficiency and good housekeeping of the departments having transfer equipment are the under-floor chip conveyors. Chips from the many operations drop down into the conveyor that carries them to an elevator which in turn discharges them into a stationary gondola.

Following are the operations performed on the head and block by four of the 10 transfer machines.

Ingersoll Transfer Machine

Station 1—Load cylinder block. Positioning is done from finished pan rail and locating holes.

Station 2—The six cylinder bores are rough bored with six spindles on left hand vertical unit.

Stations 3 and 4—Idle.

Station 5—Chamfer top and bottom of of cylinder bores.

Stations 6 and 7—Idle.

Station 8—Straddle milling is done as follows: No. 1 and 2 main bearing bridges to finished width, No. 3 to width plus 0.015 in. of stock on each side, and No. 4 to width allowing for finish cut at back end of block. Bearing insert lock slots are finish milled.

Stations 9, 10 and 11—Idle.

Station 12—One spindle on right hand horizontal unit mills generator mounting bracket pads. Three spindles on left hand horizontal unit mill pads for fuel pump, oil pressure relief valve, tappet and push rod cover, and distributor mounting adapter.

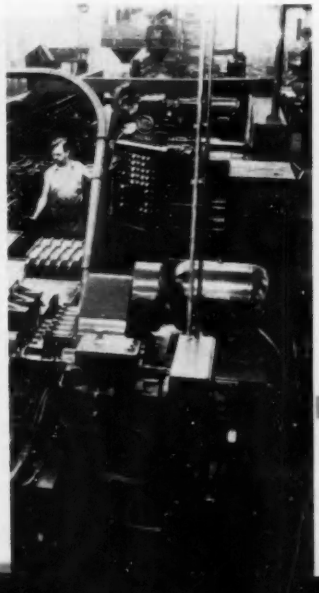
Station 13—Idle.

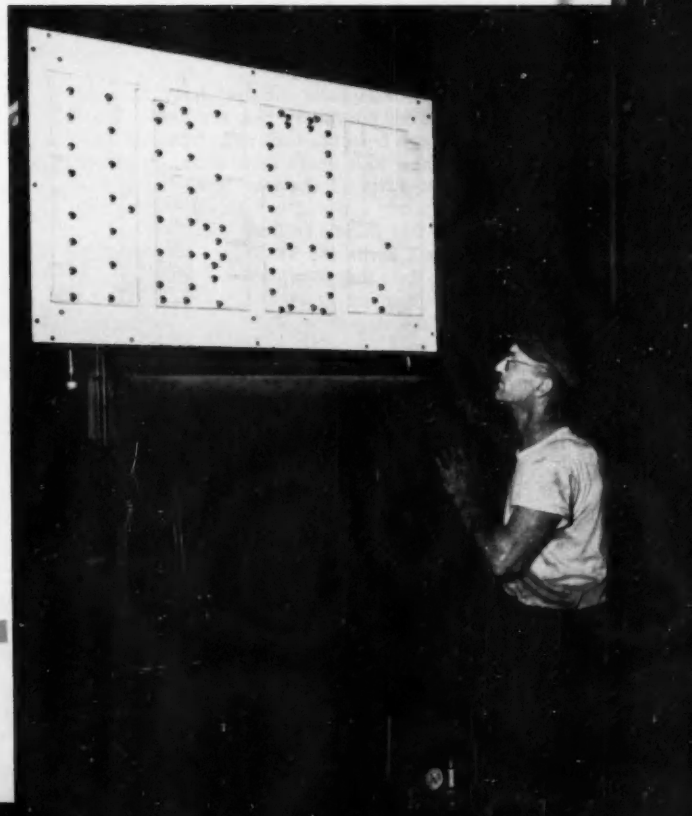
Station 14—Unload.

Footeburt Transfer Machine

Station 1—Load cylinder block. Positioning is done from finished pan rail and locating holes.

Station 2—Two spindles on first left hand unit





(Right) Before tapping, all drilled holes in the top, bottom and sides of the cylinder block are checked for depth in this electronic machine which was designed and built at International Harvester's Indianapolis Works. Red lights on the panel board indicate whether the holes are drilled to the correct depth

Top, bottom, and both sides of the cylinder head are milled on this Sundstrand transfer machine.

drill a 19/32 in. oil gallery hole 1/7th of the way through from the back end, and core drill the rear cam boss. Two spindles on first right hand unit drill a 19/32 in. oil gallery hole 1/7th of the way through from the front, and core drill the front cam boss.

(Units are referred to as "first" and "second" on this machine because they are extra long and tooling on them serves more than one station.)

Station 3—One spindle on first left hand unit drills a 19/32 in. oil gallery hole the next 1/7th of the way through the block from the back end. One spindle on first right hand unit drills a 19/32 in. oil gallery hole the next 1/7th of the way through the block from the front end.

Station 4—One spindle on first left hand unit drills a 19/32 in. oil gallery hole the next 1/7th of the way through from the back end. One spindle on first right hand unit drills a 19/32 in. oil gallery hole the next 1/7th of the way through from the front end.

Station 5—One spindle on first left hand unit drills the 19/32 in. oil gallery hole the remainder of the way through from the back end. One spindle on first right hand unit chamfers the front end of oil gallery hole.

Stations 6 and 7—Idle.

Station 8—Seven spindles on second left hand unit drill four ½ in. bell housing capscrew holes, two letter "U" bell housing tapped capscrew holes, and one 2 in. reamed welch plug hole in back end of block. Eighteen spindles on second right hand unit drill seventeen ⅜ in. tapped holes for front cover, motor support, water pump and camshaft thrust washer, and core drill one 2 in. reamed front welch plug hole.

Station 9—Six spindles on second left hand unit drill two 27/64 in. dowel holes to be reamed in assembly, chamfer two 7/16 in. tap holes, ream one 2 in. welch plug hole, and chamfer one 19/32 in. oil gallery hole in back end of block. Eighteen spindles in second right hand unit chamfer seventeen ⅜ in. tapped holes, and ream one 2 in. welch plug hole in front end of block.

Station 10—One spindle mounted on a 40 deg left hand upper angular unit drills a 3/16 in. oil escape hole in the No. 4 cam boss. This is the only angular unit; all others are horizontal.

Station 11—Idle.

Station 12—Seven spindles in the right hand tapping unit tap one oil gallery hole with a ⅜ in. pipe tap, and tap six ⅜ in. securing holes in front end of block.

Station 13—Three spindles in left hand tapping

(*Turn to page 78, please*)

Holes in both ends of the SD cylinder block are drilled, chamfered, and tapped in this Footeburt transfer drilling machine

Federal Announces

New Series of Commercial Vehicles

INTRODUCTION of a new series of light and medium duty commercial vehicles has been announced by the Federal Motor Truck Co. To be known as the Style Liner, the new vehicle is massively streamlined and incorporates many new and improved features.

The new line, comprising 10 models, is available in the 1800, 2500, 2900 and 3000 series with gross vehicle weights up to 21,500 lb and tractor-trailer weights up to 42,000 lb. Eight wheelbase lengths are offered in the new Style Liner series ranging from 126 in. to 250 in. Cab to axle dimensions are from 60½ in. to 174½ in.

A special feature of the Style Liner is Federal's new swing - lift fender arrangement. The front fenders offer greater accessibility to the engine, accessories, steering and front brakes. They are designed to raise on a concealed hinge by releasing a clasp. When complete accessibility is desired, fender splash shields can be easily removed in a few moments. New accessibility construction is claimed to permit removal of the radiator core in less than 10 minutes.

Other accessibility features have been incorporated in the new vehicles. A hinged push button panel on the instrument board gives full accessibility to

(*Turn to page* 49, *please*)

General Specifications

New Federal Style Liner Series Trucks

Basic Series	1800	2500	2900	3000
Wheelbase Range (in.)	136-250	136-250	136-250	136-250
Gross Vehicle Weight (lb)	17,000	19,000	21,500	21,500
Cross Combination Weight (lb)	31,000	35,000	38,000	42,000
Engine Displacement (cu in.)	263	282	320	339
Horsepower at rpm	96-3000	102-3000	112-3000	126-2800
Torque at rpm	190-1600	212-1400	250-1400	272-1400

Sheet metal on the Style Liner series of commercial vehicles is constructed as an integral unit and rubber mounted on the frame. The new Federal 3000 series tractor shown here is powered by a 339 cu in. engine that develops 126 hp at 2800 rpm. GVW for the unit is 21,500 lb, with a tractor-trailer combination rating of 42,000 lb.

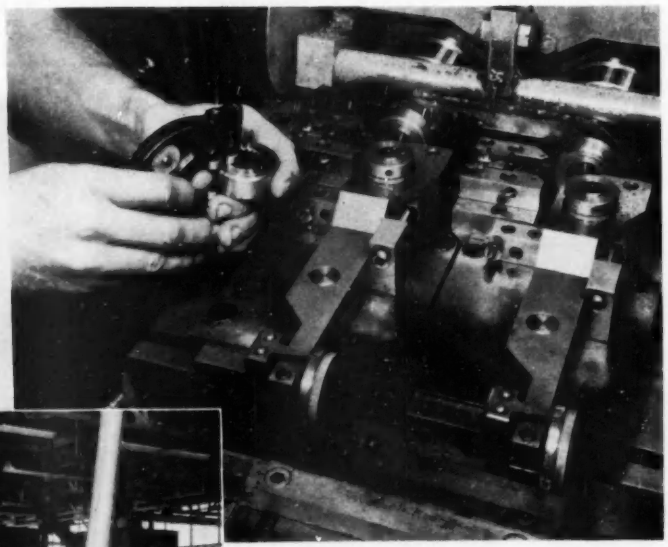
Unusual Machining Methods

By Joseph Geschelin

THIS article is concerned primarily with a sampling of unusual methods employed in the machining of some of the major Powerglide transmission castings at the Chevrolet-Cleveland plant where all of the machining and assembly operations are concentrated. In addition, the reader will find notes on the fabrication of the unique planet carrier and output shaft assembly which combines in a unit—a stamped planet carrier, a drop-forged flanged output shaft, and a stamped reverse lock gear closure.

In the interest of space economy, the machining of three major castings—the valve body, transmission case, and transmission housing—will be confined to a sampling of operations. It may be repeated at this point that these castings, as well as smaller castings going into the Powerglide assembly, all are given the stress-relief and de-siliconizing treatment described earlier (see AUTOMOTIVE INDUSTRIES, May 1, 1950) to stabilize the structure and to remove all sand particles from pockets and from the surface.

The valve body is precision-machined in every detail. It is prepared by milling the front face in a Newton mill, drilling and tapping several holes including two holes for locating on succeeding operations (Allen drill). Facing, turning, core drilling and reaming of



One application of the two-spindle New Britain precision boring machine is the one shown here—on the reverse sun gear.

As an example of the variety of Ex-Cell-O equipment found in this plant, this view shows the line-up of Ex-Cell-O's on valve bodies.

for Powerglide Castings

This is the Third Article in a Series Describing Some of the Highlights of the Manufacture of the Chevrolet Powerglide Transmission. The First Article, Which Appeared in the March 1 Issue of Automotive Industries, Was Concerned With the Fabrication of the Torque Converter Parts. The Second Article, Published in the May 1 Issue of Automotive Industries, Described Some Interesting Operations at the New Chevrolet-Cleveland Plant.

the hub extension, used to locate the clutch drum assembly, are done on an 8 spindle, type D Bullard Mult-Au-Matic.

Then follow in succession the drilling and reaming of holes in a group of Ex-Cell-O special machines. One of these is a multiple-head machine for the drilling of all normal holes and three angular holes. Another completes the remaining holes. A third unit does the drilling and reaming of valve holes.

The front face now is lapped in one of the Crane Packing Co. automatic lapping machines, holding 12 pieces at a time in four cluster fixtures. For quality, the operation is specified with flatness to give at least 90 per cent sealing contact against a flat master on all lands; and free from scratches across the lands.

Next comes precision boring and finish turning of all details and grooves in the hub, in a set-up on a Model 321 Heald Bore-Matic.

Finally there is a series of four operations in separate set-ups on Ex-Cell-O single-end precision-boring machines, as follows:

1—Semi-finish-bore manual valve hole.

2—Semi-finish-bore and counterbore pressure regulator valve hole.

3—Finish-bore and counterbore pressure regulator valve hole.

4—Finish-bore manual valve hole.

The transmission case is prepared initially by boring, facing, chamfering, drilling, and reaming the front end in a single-index, Type D, eight-spindle Bullard Mult-Au-Matic. Facing, boring, and turning the flange OD on the opposite end is done in a single-index, six-spindle, Type D Bullard Mult-Au-Matic. Four pads are milled on a three-spindle, Sund-

Close-up of work station of the special Snyder machine for drilling, chamfering, and line-reaming of planet pinion shaft bores in the planet carrier and output shaft assembly. This machine is of double-end type with a four-station trunnion type table for work holding.

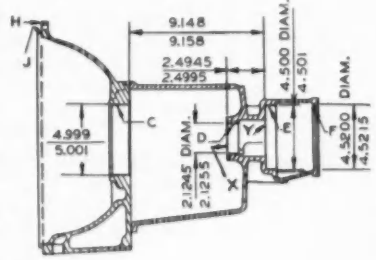
strand Rigidmil.

This is followed by a Cross multiple spindle drilling machine of five-station type with automatic index having 30 spindles whose primary purpose is to drill and ream all holes in front face and inside of case not already drilled in the Bullard, including two dowel holes used for location in succeeding operations and to assemble with the housing.

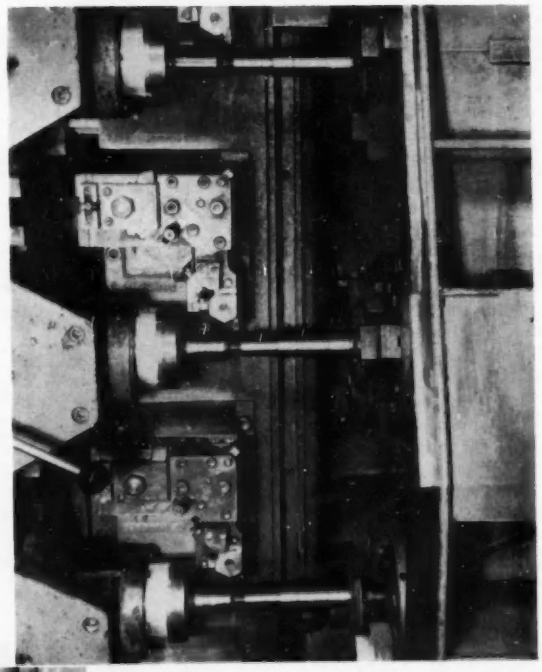
The most impressive equipment on this line is the special 15-station Cross Transfer-matic machine which is unusual in its compactness and economy of floor space. Work is handled on pallet type fixtures and transferred from station to station by means of a hydraulically actuated transfer bar, extending the full length of the machine. In all the machine has been provided with 20 pallets, three of which float on the rapid-return conveyor traversing the outer sides of the machine.

The arrangement of heads and stations, together with the number of holes handled at each head is given in Table I on next page.

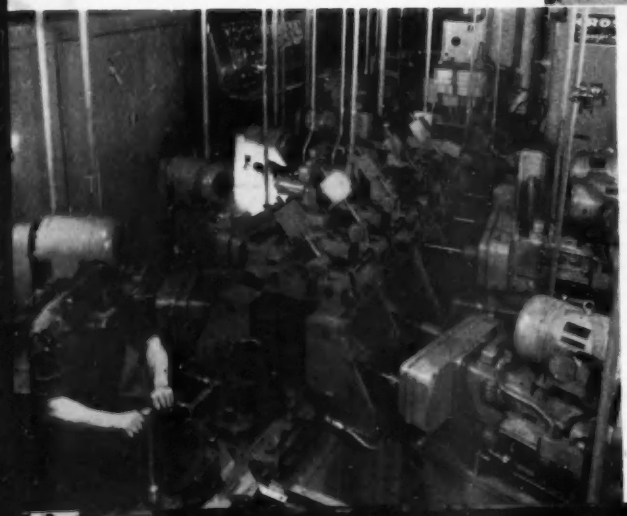
It may be noted that heads A to G inclusive are mounted on the left side of the machine; head I is vertical; while heads H, J, K, L, and M are on the right hand side. Lettered tags attached to the heads



After the transmission housing and case are bolted together and line bored, reference surfaces indicated here are held to the following limits: Maximum run-out based on center line established by centers of diameters C and D must not exceed 0.003 in. for E and F, nor 0.005 in. for H and J. Surfaces X and Y must be parallel and square with axis within 0.0005 in. per in. All limits are for total indicator reading.



Here is a close-up of the three-spindle work station of the Bullard Man-Au-Trol machine, tooled for turning the output shaft stem in a single setting at high speed. The triangular cemented-carbide tools may be seen mounted in the tool blocks.



Loading end—first station—of the 15-station Cross Transfer-matic for drilling of the Powerglide case. Cases are handled on individual pallet fixtures such as shown at the extreme left in the foreground. The tool rack—mentioned in the text—may be seen indistinctly in the background.

Methods for Powerglide Castings

Table I

Station	No. Heads	Operation
1	A, H	Drill—2
2	A, H	Counterbore—2
	(2) B	Drill—3
3	(3) B, K	Drill—4
4	C, K	Drill—2
5	(2) C	Drill—2
	L	Counterbore—1
6	E	Ream—1
7	(5) I	Drill—5
8	(2) D, (2) I	Drill—20
9	(3) D, (3) I	Drill—11
	I	Counterbore—1
12	J	Drill—1
	(2) F	Countersink—14, Ream—2
13	J	Spotface—1
	(2) F	Drill—1, Bore—2
14	(2) G	Recess—1, Bore—2
15	M, G	Tap—1, Bore—2

are used to associate the heads with the tools in the special rack described below.

Tapping of 29 holes in the case is done in a Cross four-way tapping machine which has a left- and right-hand head, a head at the rear, a vertical head, and two angular heads.

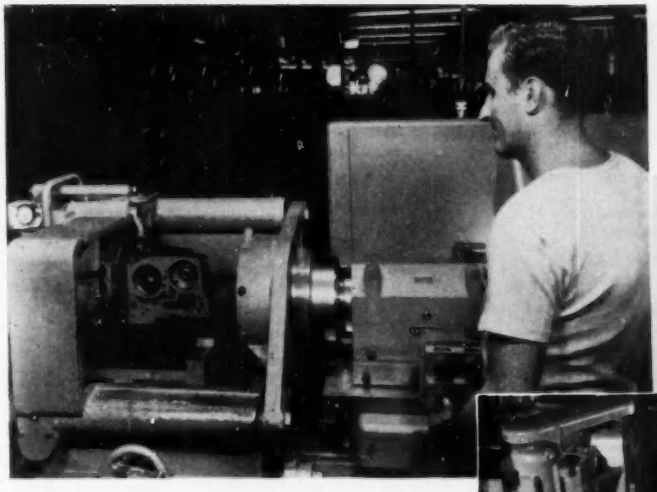
Another Cross machine, of four-station index type, is used for drilling three angular holes and tapping six flange holes.

Supplementing the Cross equipment installed here, is a large rack which holds the tools required for quick servicing of all spindles. The tools are pre-set for size and length by means of a complete set of tool-setting gages also mounted on the same rack. Thus it is possible to make changes of tools rapidiy and without consuming the usual down time for tool setting in the machine.

Latest development on the case line is the introduction of a new and improved 72-in. version of the Crane automatic lapping machine, for lapping the front face and servo cover face, these faces being lapped on different machines. Despite the size and weight of the castings, each lapping machine handles 12 cases at a time.

Chevrolet has three transfer machines in operation at the present writing. In addition to the one described above, there

(*Turn to page 70, please*)



Axial alignment of the transmission housing and case is established when the finish-machined parts are bolted together and line-bored in a big Ex-Cell-O precision-boring machine shown here.

Another of the 15-station automatic transfer machines is the W. F. & John Barnes installation for drilling the transmission housing. This view shows the loading station. Pellets are returned to the loading station on the elevator directly at the right hand of the operator in this view.

Effects of

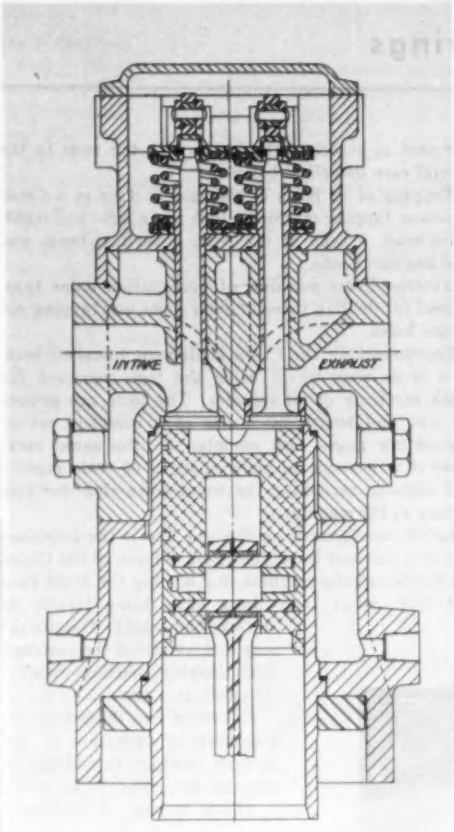


Fig. 1—Longitudinal section of the test engine showing details of the valves, head and squish type piston.

DATA obtained with a 3¼-in. bore by 3¼-in. stroke single cylinder engine which was designed and built for exploration of compression ratio and other effects of interest in the passenger car engine field are presented here in condensed form. Fig. 1 shows a longitudinal section of the cylinder, known as the 27 cylinder, which bears no resemblance to any existing passenger car engine. Compression ratio and combustion chamber effects on fuel economy and knocking were extensively explored over a compression ratio range of 5.7 to 15.0 and over a speed range of 1200 to 3000 rpm. A limited investigation of knocking behavior was carried out at compression ratios of 21.3 and 30.

The intake and exhaust ports of the 27 cylinder are so arranged as to produce a minimum of induction turbulence. Turbulence, in addition to that obtained with a flat top piston and a normal intake valve, is obtained first, by use of a shrouded intake valve and second, by squish pistons. Squish pistons and a shrouded intake valve can be and have been used together. Squish pistons confine the majority of the charge within the piston crown as shown in Fig. 1.

Appraisal of Data

All data are in terms of indicated performance which is obviously necessary in this case since at 3000 rpm and 10-in. Hg absolute manifold pressure, fmep was about 80 lb and bmep about 50 lb.

Knock limited performance is treated in terms of permissible combustion chamber air density on any given fuel. This density has been termed knock limited true air density. Since mass air flow data are so rarely available, an empirical equivalent of true air density was investigated and knock limited density index was evolved. Density index is derived from imep air cycle efficiency and compression ratio as follows:

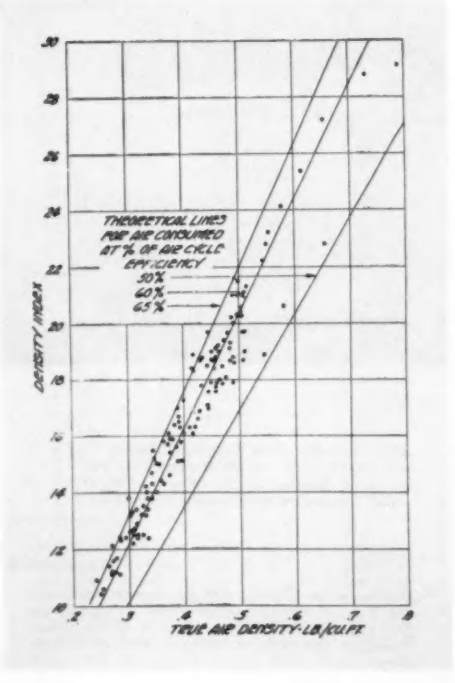


Fig. 2—Relation of knock limited true air density to knock limited density index.

Mechanical Octane Numbers

By S. D. Heron
Consulting Engineer,
and
A. E. Felt
Research Engineer, Ethyl Corp.

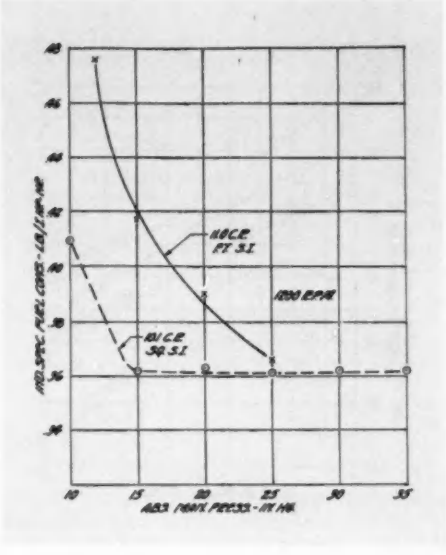


Fig. 3—Specific fuel consumption versus intake manifold pressure for two combustion chambers of 10.1 and 11.0 compression ratio. Maximum economy fuel-air ratio and spark advance. F.T. = flat top piston. S.I. = normal intake valve. SQ. = squish piston.

$$\text{Density Index} = \frac{\text{imep (Compression Ratio-1)}}{\text{Air Cycle Efficiency Per Cent}}$$

That this formula bears a reasonable relation to true air density is shown by Fig. 2.

Density index and true air density take account of both compression ratio and volumetric efficiency and this is obviously important since W. M. Holaday has shown that an automobile with about 7 to one compression ratio runs quite well on heptane if the throttle is not opened too much.

In this project 80 per cent diisobutylene + 20 per cent heptane (hereafter 80 per cent D.I.B.) were almost entirely used as the sensitive test fuel and its knock limited performance was compared with that of isooctane and 80 per cent octane + 20 per cent heptane (hereafter 80 O.N.). The result is expressed as imep ratio and this is the ratio of the knock limited imep of 80 per cent D.I.B. divided by the knock limited imep of isooctane or 80 O.N. and enables the performance of the blend to be located in terms of the reference

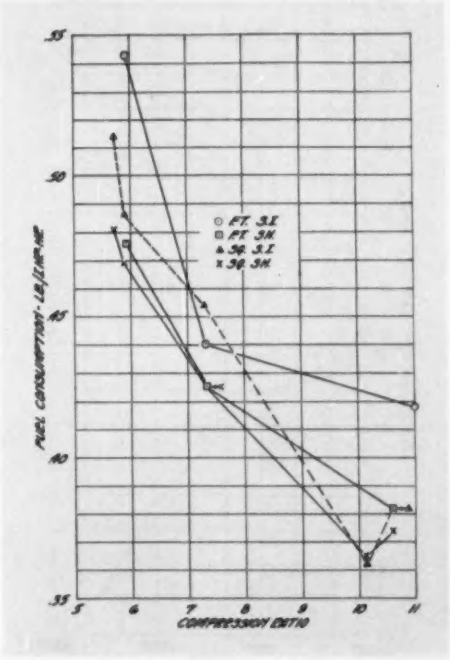


Fig. 4—Fuel consumption versus compression ratio and combustion chamber type at 1200 rpm and 15-in. abs manifold pressure with maximum economy fuel-air ratio and maximum economy spark advance. F.T. = flat top piston. S.I. = normal intake valve. SH. = shrouded intake valve. SQ. = squish piston.

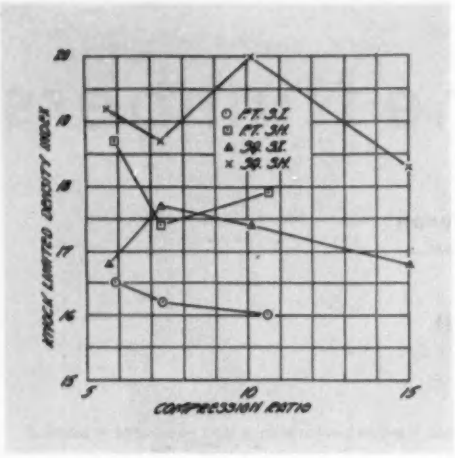


Fig. 5—Knock limited density index of isooctane at 1200 rpm versus compression ratio and combustion chamber type. F.T. = flat top piston. S.I. = normal intake valve. SH. = shrouded intake valve. SQ. = squish piston.

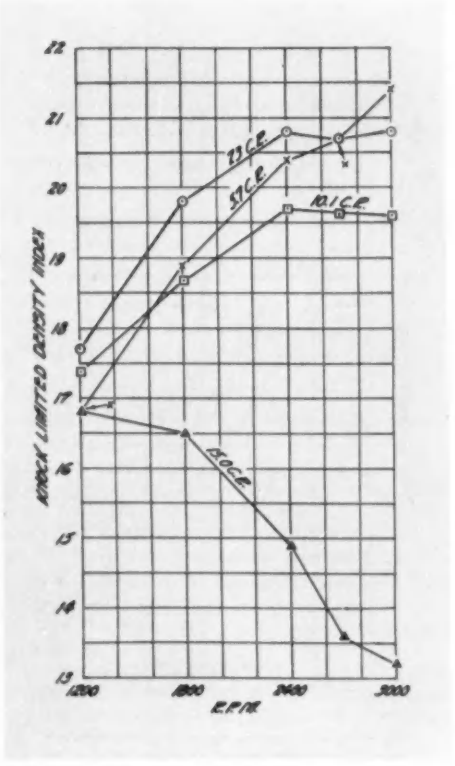


Fig. 6—Knock limited density index of isooctane with squish pistons and standard intake valve versus compression ratio and rpm.

fuel blends. In addition to the use of 80 per cent D.I.B., a considerable amount of testing was carried out with straight diisobutylene (hereafter 100 per cent D.I.B.).

The procedure was to vary manifold pressure to determine knock limited performance on isooctane, 80 O.N. and 80 per cent D.I.B. This was used rather than running at constant manifold pressure and determining the necessary blend of reference fuels to just obtain incipient knock. The test program was devoted

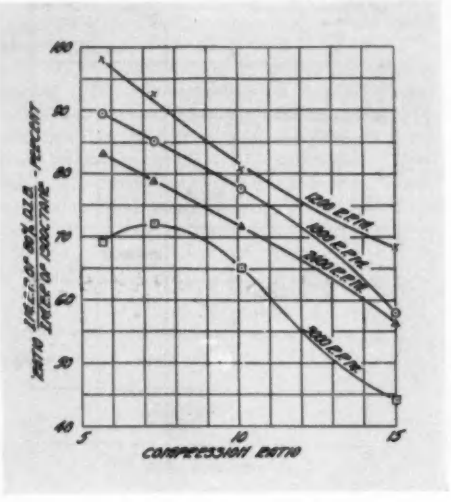


Fig. 7—Imep ratio of 80 per cent D.I.B. versus compression ratio and rpm for squish pistons and standard intake valve.

to determination of cylinder performance and not to testing fuels. Fuels tested were merely necessary tools for the determination of cylinder performance. Pure compounds were used throughout as fuels and this has made it possible to compare data with that obtained in other laboratories with other engines.

Test Data

Fuel economy was considered to be an item of major interest in the test program, and economy at the approximate speed and load corresponding to 30 mph road load in a passenger car engine was considered as the most important economy criterion. An intake manifold pressure of 15-in. Hg absolute and 1200 rpm

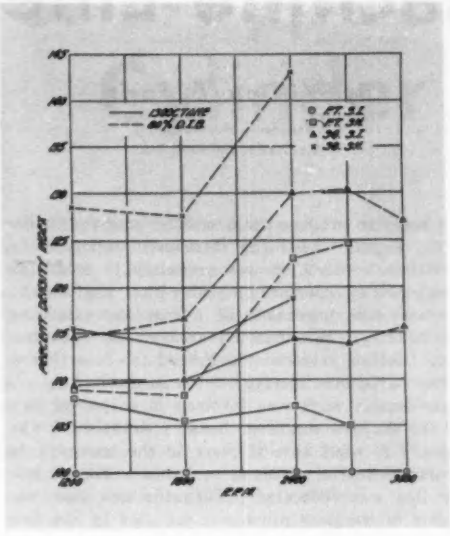


Fig. 8—Per cent gain in density index due to turbulence versus rpm for isooctane and 80 per cent D.I.B. for the 7.3 compression ratio group. F.T. = flat top piston. S.I. = normal intake valve. SH. = shrouded intake valve. SQ. = squish piston.

were chosen as reasonably representative of 30 mph road load.

Fig. 3 shows the fuel economy of two combustion chambers of similar compression ratio over a range of manifold pressure and is sufficient to show that full throttle economy is not necessarily any index of part load economy.

Specific fuel consumption versus compression ratio at 1200 rpm and 15-in. manifold pressure for four groups of combustion chambers under maximum economy conditions is shown in Fig. 4. This figure shows the pronounced effect of combustion chamber design upon part load fuel economy. Fuel economy was found to be considerably better at 3000 rpm than at 1200 rpm. Part of the gain in fuel economy with increase of compression ratio results from the fact that maximum fuel economy is developed at a leaner mixture as the compression ratio is increased. Fuel-air ratio is at least as important as compression ratio in respect to fuel economy.

Relative thermal efficiencies in terms of both fuel and air do not differ widely over a considerable range of compression ratio. In the light of test results, relative thermal efficiency appears to be a reasonably sound method of reporting data obtained over a compression ratio range of 5.7 to 15.0.

Comparison of the relative thermal efficiency of the 27 cylinder with that of overhead valve and L-head passenger car engines showed that a well developed L-head has thermal efficiency similar to that of a good overhead valve type.

Knock Limited Performance

Fig. 5 shows the relation of knock limited density index of isooctane at 1200 rpm versus compression ratio and combustion chamber type. It is worthy of note that at the 10 to one compression ratio level the best combustion chamber combination is about 25 per cent better than the poorest type. Effect of rpm and compression ratio on the knock limited density in-

(*Turn to page* 64, *please*)

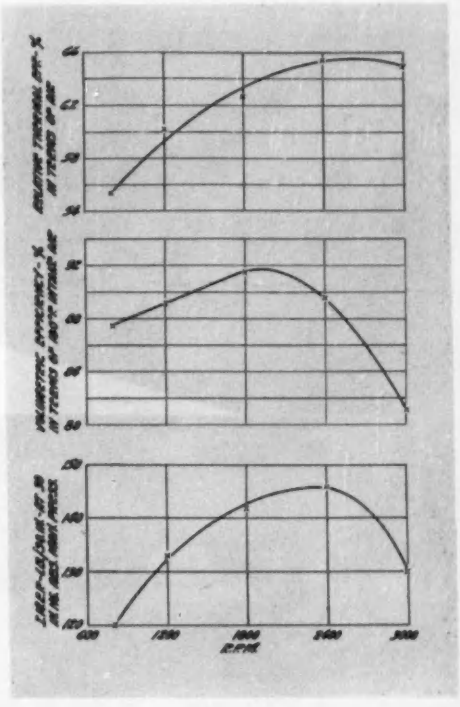


Fig. 9—Imep, volumetric efficiency and relative thermal efficiency on air versus rpm with 10.1 compression ratio squish piston, standard intake valve, 180 F jacket inlet. 180 F intake air, 0.080 fuel-air ratio, maximum power spark advance, and 30-in. Hg abs manifold pressure.

New Machine Line

By William E. Paris

Vice-President, Manufacturing,
Willys-Overland Motors, Inc.

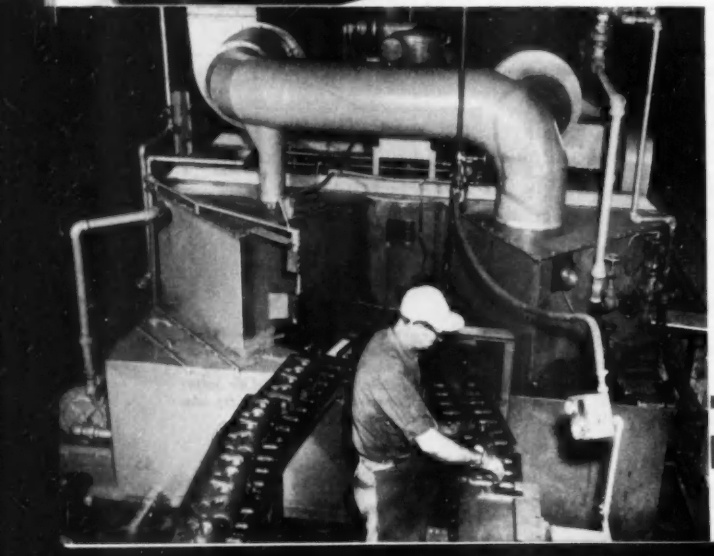
IN order to produce the new Hurricane four-cylinder engine, now being introduced nationally by Willys-Overland, it was necessary to create an entirely new cylinder head machine line. Eight major machines were purchased at a cost approximating $325,000.00. In less than a year after our Manufacturing Division received the F-head job to estimate, finished parts were moving off the assembly line.

Considerable work was involved in preparing this area for the new machine change. Actually, it was necessary to erect several piers in the basement to support the heavier pieces of equipment. The old machine line was re-located. Then the new line was installed in the area previously occupied by the line that for many years had been turning out Go-Devil engines. The older head now will be used for Jeep engines and parts order requirements only.

Great care was exercised in the selection of equipment and tooling for this line, in view of the rigid requirements on this cylinder head and the close tolerances involved. Processing of the part and floor layout likewise were thoroughly analyzed to provide the required quantity and quality at a minimum operating cost.

The following are descriptions of the major machines and the operations which they perform:

(1) Mill top and bottom of cylinder head on an eight-spindle, 13-station rotary type Newton milling machine which was used for the L-type head.



Top—This special Colonial hydraulic press has been designed for pressing-in of valve guides. It is of three-station type with automatic transfer from station to station.

Left—Automatic in operation, the special Schmieg washing machine has 12 stations fed by a rotary indexing table.

for F-Type Cylinder Heads

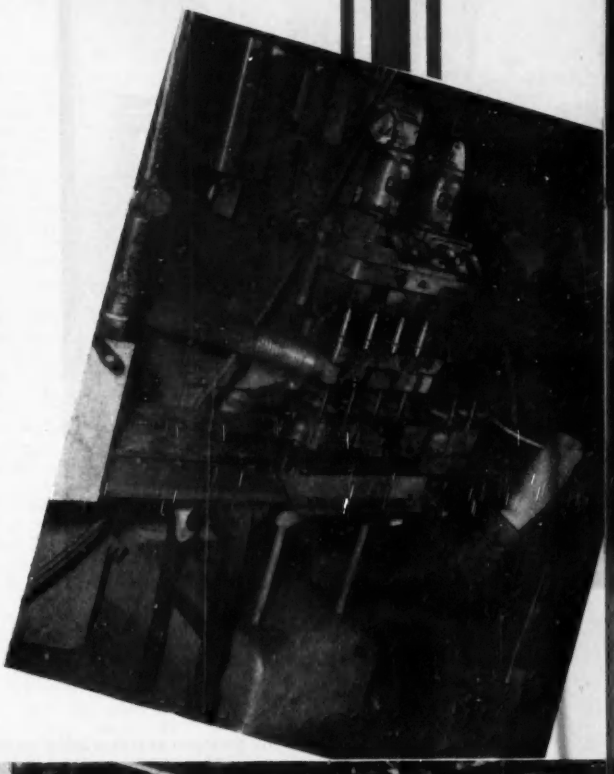
The 13 fixtures on this machine were designed to machine either the new 4-FB head or the old style L-type head. Locating spots used for this operation are taken from the two end combustion chambers and one lug cast on the side. By this means, the combustion chamber volume can be held to part print tolerances of three cc. Gages on this operation were designed to indicate the source of scrap, whether machining or foundry.

(2) Drill 15 stud holes, four push rod holes, 15 water circulating holes and drill and tap 1-⅛-27 pipe plug hole in rear end on a new 75-spindle five-station index Baker drilling and tapping machine.

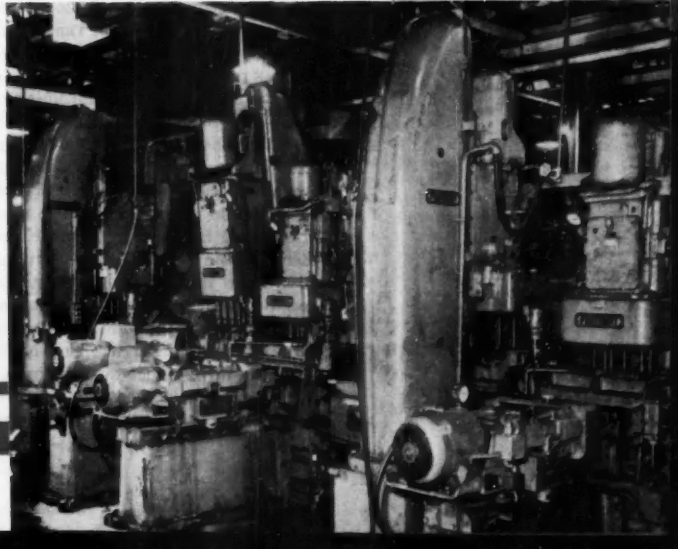
Fixtures on this machine were designed to locate the casting from the two end combustion chambers. The casting is mechanically equalized from these chambers and simultaneously clamped, insuring proper location of all drilled holes. Two stud holes on the extreme ends are reamed and used as locating holes on all subsequent operations.

(3) Drill, chamfer and tap all holes in top; drill, spotface and tap spark plug holes; drill and spotface four valve guide holes; drill, spotface, chamfer and tap holes on side on a new 56-spindle, six-station, fixed center, hydraulic feed and lead screw Footburt drilling and tapping machine.

The casting is loaded in this station type machine with top surface down, then mechanically tumbled 180 deg to



Top—New in the production set-up is this Waterbury, four-spindle valve seat grinder.



Right—An example of a multiple-station transfer machine is the Footburt unit shown here. It has a total of 56 spindles, six stations, and is of hydraulic feed and lead screw type.

Machine Line for F-Type Cylinder Heads

Baker Bros. developed this 75-spindle, five-station automatic indexing, drilling, and tapping machine.

an unload position waiting to be transferred to the next station. There is an idle station ahead of the tapping units. Chips from all holes to be tapped are removed at this station by compressed air. At the ninth and last station there is another tumbling fixture which turns the head back to its original position ready for the next machining operation. From this point on through the line, the head remains on the conveyor bottom up.

(4) Rough form valve throats and spotface top of valve seats; drill and tap one hole in front end; centerbore welch plug holes in rear end; semi-finish and finish valve guide holes on a four-station, 16-spindle Baker index drilling and tapping machine.

This machine consists of one vertical unit with 12 spindles and three horizontal units with four spindles. The casting is located in the two locating holes and clamped into position ready for machining. This is a new machine.

(5) Press valve guides in place on a new Colonial hydraulic press.

There are three stations with automatic transfer of casting from station to station. The casting is loaded in the first station between guide rails and backed against an approximate stop. At the cycle of the machine a transfer bar shuttles the casting to pressing station No. 2. At this station the casting is automatically located. From beneath the casting, brushes enter the valve guide holes and withdraw, cleaning out the holes and leaving an oil film. After the brushes return to their normal position, a shuttle holding four valve guides moves out over the top of the casting. At this point the ram moves downward, picks up the four valve guides and presses them into position.

The predetermined pressure required on the ram to press the four guides in place is indicated by pressure switches and signal lights. If the required press fit is too tight or too loose, the machine cycle will stop, indicating by a light which hole is off. If the required press fit is held, the ram raises to its normal position. The shuttle moves out, picks up four more valve guides from a tube-loaded hopper, and then the next casting is transferred into position, repeating the same automatic cycle.

(6) Ream valve guides and finish ream valve throats on a new three-station, eight-spindle Baker index drilling machine.

Now that the valve guides have been pressed into place and protrude out over the top of the casting, a special conveyor is required. This conveyor is split to allow the guides to pass through the rolls. Guide rails touch the sides of the casting in order to prevent damage to the valve guides.

The casting is loaded in this machine, located and clamped in the same manner as mentioned in No. 4. At the first working station the valve guides are reamed to size. They then are indexed to the next station where reamers locating in the valve guides, ream the valve throats to size, holding the concentricity of the two within 0.005 in. total indicator reading. The castings are unloaded from the machine and pass through a blow-off fixture preparatory to inserting expanding pilots in the valve guides for machining the seats.

(7) Machine Valve Seats on a four-spindle Natco drilling machine.

The casting is again located in the same manner and clamped. On this opera-

(*Turn to page* 58, *please*)

By Michael Chinigo

Turin Show

Features Cars from Eight Nations

TURIN, ITALY

THREE hundred exhibitors from eight nations on both sides of the Atlantic and from back of the Iron Curtain made the 32nd edition of the Turin Automobile Show last month a real mid-century success. The United States with its presentation of Buick, Cadillac, Chevrolet, Crosley, Chrysler, Dodge, Ford, Hudson, Kaiser-Frazer, Mercury, Nash, Oldsmobile, Packard, Studebaker and Willys-Overland took undisputed top honors for number of models shown and for size and luxury of the cars themselves. In fact, with the exception of one Italian, one Czech, one German, and two or three British high-priced, high-piston-displacement presentations, the United States exhibitors were practically alone in the big car class.

However, with the limited market for big cars — gasoline consumption being the determining factor — going over practically uncontested to the American product, the show was characterized by a stiff battle in the small car field. The contest found Italy vying stubbornly against stiff competition especially from Britain, but also from France and Germany.

Among the considerations which influence prospective Italian buyers, fuel consumption—gasoline sells for about 80 cents per gallon—and the condition of Italian roads hold top priority. Consequently Italian automobile producers who cater to Italian and other European buyers make the same considerations "musts" in construction.

Italian manufacturers, in this postwar as in the prewar period, have concentrated on producing small cars of high engine efficiency and low fuel consumption with mechanical and body improvements which meet essential performance requirements. Most Italian engines are four cylinder, in-line, with overhead valves, and piston displacement ranging from 30 to 120 cu in.

Of the Italian manufacturers, Fiat alone has abandoned the rigid body lines of yesteryear to turn out abbreviated editions of American styling adapted to the exigencies of the Italian road system and to Italian taste which is always reluctant to accept the too daring.

Another feature of these smaller cars is their weight which is kept at approximately the one-ton level, again for reasons of fuel economy and easy maneuverability on Europe's hairpin-curve studded highways.

In the smallest category, Italy finds serious competition from the British Morris Minor, which has an all-steel body-frame combination and a 56 cu in. engine. A semi-floating rear axle, "draughtless ventilation," and a price lower than anything in its class, including the smaller Fiat Topolino 500 C, makes the Morris Minor the most serious threat to Fiat's efforts to hold the Italian lowest price market.

Italian automobile manufacturers are pressing the Italian Government for a more understanding attitude similar to that being shown by trade-conscious Britain's Labor Government. Raw materials going into a passenger car or truck cost Italian manufacturers 50 per cent more than their British competitors and labor, which one would expect to be cheaper in Italy, is 17 per cent higher per unit produced than in England, even though Italian salaries are about 20 per cent below those of British automobile industry workers. High labor cost is due to 17 Italian holidays yearly against six in England, 15 days vacation yearly against five in England, 200 hours with pay at year's end against none in England, and in addition the world's highest social security taxes.

However, Italian industry has produced a better looking product and the Turin show demonstrated its success. Body lines which are more flowing, and more attractive colors, were more in evidence in the Italian than in the British models, but it's a close race.

Outstanding, in the show, were exhibits of the numerous specialized Italian body builders. Italian manufacturers, limited to one or two models by exigencies of economic production, turn over their more particular clientele to special body builders. Of the numerous Italian body builder displays, one in particular attracted considerable attention. It has a tubular frame with a Ford engine and an Italmeccanica supercharger. With a body by Farina, this car, called tentatively Italmeccanica, is destined for the U. S. market.

Another novelty was the first model of a two and one-half ton Leoncino truck. It has a four-cyl, 54 hp Diesel engine.

From behind the Iron Curtain came the Czech Skoda with a four cyl, overhead valve, 66 cu in. engine. Maximum speed of the car is said to be 60 mph. It has no special characteristics or outstanding developments in engine or mechanical details, and the body style is antiquated with rigid prewar lines.

Similarly, Germany presented two models of the Mercedes-Benz, and likewise demonstrated that while it is rapidly coming back into full production, the industrialists have not had time or interest enough to improve the engines or the prewar body lines.

Italian automobile production jumped better than 61 per cent during the first three months of this year over the corresponding period of 1949, the total for all types of vehicles being 28,768. Passenger cars numbered 21,747, delivery vans were 4264, trucks 1886, and buses 871.

Exports for all types of vehicles increased from 3397 during the first quarter of 1949 to 3858 this year. The increase was entirely on passenger cars, trucks and buses showing an important drop.

Federal Announces New Series

(*Continued from page* 37)

electrically operated gages. All electrical circuits are individually fused and fuses are located on a multiple fuse block in the engine compartment on the dash.

Mechanical improvements in the series include a wider track front axle and shorter wheelbases for shorter turning radius. Front and rear springs have been lengthened, and front springs and shackles have been rubber bushed. Spring cushioned radius rod drive has been made standard on most models.

The Style Liner cab, wider and roomier with built-in slip-free running boards is 66½ in. wide at shoulder height and 77 in. wide at the bottom. It is of all-steel welded construction with a one-piece top and is strongly reinforced throughout.

A choice of four high torque truck engines with ratings to 126 hp are available in the new series. Engine features include full pressure lubrication, positive crankcase ventilation, copper lead main and connecting rod bearings and seven-bearing, Tocco-hardened, counterweighted and balanced crankshafts. Vibration dampers also are standard on larger engines.

Federal will continue to manufacture its full line of heavy duty models in addition to the new series.

By Joseph Geschelin

Making Torque Plaster

WHEN Packard approached the launching of its Ultramatic drive, one of the major considerations was a decision as to the method of making the rotating elements of the torque converter. From an engineering standpoint, the method thus selected had to assure the proper development of a multiplicity of curved vanes, accurately contoured passages, and fine surface finish to assure smooth fluid flow; from the manufacturing side, there was the requirement of maximum economy coupled with a minimum outlay for tooling.

Preliminary contacts with the Aluminum Co. of America indicated the possibility of applying a unique plaster process casting technique which had been under study for some time at the Alcoa research laboratories in Cleveland. Cooperative effort on the part of both organizations resulted in the finalizing of the process now in regular use. It is also of interest that the Alcoa foundry in Cleveland took care of Packard's immediate production requirements for some time. More recently the operation was transferred to the Alcoa foundry in Detroit where a compast mass production setup—the subject of this article—was established.

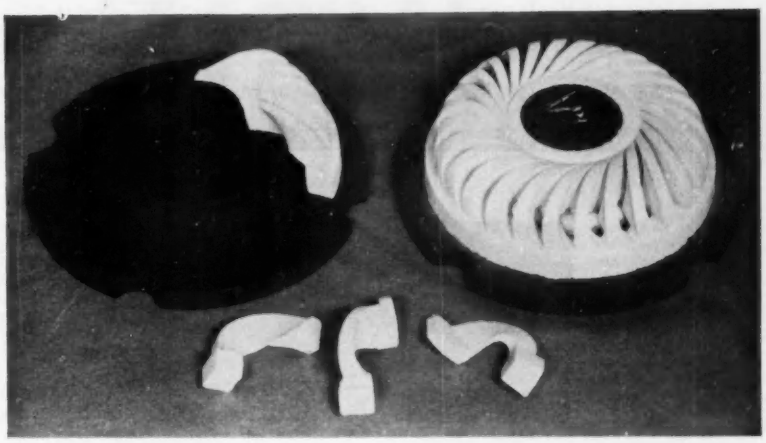
The Alcoa foundry process for producing cast aluminum torque converter parts includes the use of cores combining dry sand structures with an assembly of plaster core pieces. Cope and drag are machine molded with green sand, in more or less conventional fashion, using metal patterns.

Without going into the mass of detail involved in the current technique, it may be of interest to highspot a few of the problems that required solution. These included: the selection of a suitable plaster composition; an economical method of precision casting plaster cores; design of the best form of gating and risering arrangement; establishment of standards for pouring temperature, the aging cycle, and core drying; the layout of a compact floor plan for mass production at lowest cost.

Suffice it to say that the present set-up has resulted in a technique admirably suited for the production of torque converter rotating elements which should be suited as well for the making of parts of intricate design where dimensional accuracy and perfection of surface finish are matters of primary importance.

Packard torque converter castings are made of the familiar No. 319 alloy, a free-flowing, low specific gravity aluminum alloy. Total weight of the four castings, in the rough-cast state, is approximately 24½ lb. A feature of interest to designers is that the intricately formed passages of the various elements are produced with the desired tolerance on the thickness of vane walls, the passages being held true to configuration. What is of greatest importance, the vane surfaces have a fine, smooth finish which does not require further machining or

Worker in the left background is setting plaster assemblies into the drag while the cope is being hoisted as shown in the right foreground prior to closing it on the drag.



Partial and complete plaster cast assembly for first turbine casting.

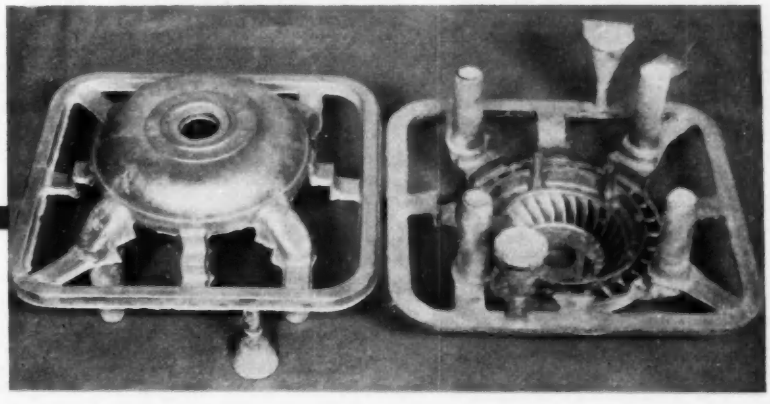
Converter Parts by Casting Process

preparation. Of interest too is that cores are produced with such fine accuracy as to make possible the assembly of molds having a large multiplicity of vane elements. For example, the pump member has a total of 25 vanes, the turbine 28, the secondary turbine 31, and the stator 33 vanes.

Starting point of the Alcoa process is the making of "plaster cores" of very fine textured materials bonded with a plaster base product supplied by one of the well known gypsum products manufacturers. Plaster cores are made by pouring the mix into special core boxes made of a cast thermosetting plastic. Core boxes consist of assemblies of accurately made sections, clamped together to form a mold of precise shape. Such sectional construction makes it possible to dismantle the core box for removal of the plaster core without injury. Core boxes, in turn, are made by pouring the plastic formulation into extremely accurate metallic molds designed to assure dimensional fidelity.

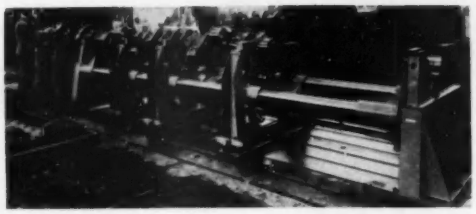
At the start of the process, the plastic core boxes

(*Turn to page* 76, *please*)



Drag and cope faces of the first turbine casting with gating.

FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 62



A product of Gisholt Machine Co., Madison, Wis., this Dynetric type 6-UH balancing machine for Diesel crankshafts is shown installed at the Baldwin Locomotive Works, Eddystone, Pa. Mounted in the machine is the 4,790-lb. crankshaft used with the 8-cyl Super Charged Diesel engine. The amount and location of the dynamic unbalance is measured to an accuracy of one lb-in. This is equivalent to a measurable displacement of 0.0002 in. at either end of the holding cradle.

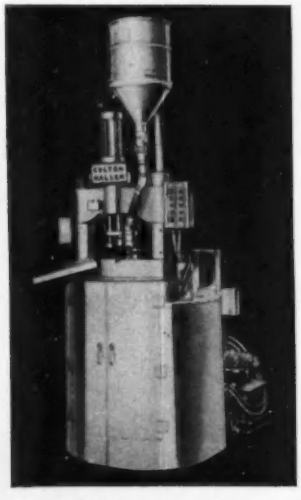
J-79—Diesel Crankshaft Balancing Machine

J-78—Presses for Powdered Metals

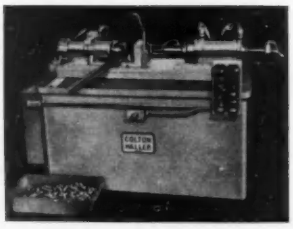
Snyder Tool & Engineering Co., Detroit, Mich., announces arrangement by which the Arthur Colton Division will build and market powdered metal presses incorporating the patents, designs and process techniques developed by John Haller, president of Michigan Powdered Metal Products Co., Northville, Mich.

Snyder, specializing in heavy machinery for 25 years, purchased the Arthur Colton Co. in 1949, which has specialized in pharmaceutical and packaging machinery and tableting presses for over 65 years. By the arrangement, the established line of Colton preforming presses will be extended through addition of the Colton-Haller line of vertical, single-punch hydraulic presses.

The new Colton-Haller presses will be made in the following capacities: 25 ton with 5 in. fill, 40 ton with 8 in. fill, 100 ton with 9 in. fill, and 125 ton with 9 in. fill. The 25 ton is a two tie rod press; the others are four tie rod presses. Fills are adjustable from zero to the machine's capacity, and filling is by means of a reciprocating shoe mechanism for powdered metal work. A shuttle feed is available for plastic preform work.



Colton-Haller 25-ton powdered metal press



Colton-Haller horizontal hydraulically operated sizing press is first of its kind in U. S. for bringing powdered metal parts back to accurate size after heat treatment

All machines are designed for rapid approach speeds, and slow pressing speeds. All offer hydraulic operation at high pressures in processing powdered brasses, copper alloys, iron, steel, stainless steel, aluminum, etc.

A wide variety of motions are available: One from above and one from below with stationary core-rod; one above, two below, both pressing motions; one above, two below, one of the latter a pressing motion and the internal motion a movable core-rod; two above and one below; two above and two below. The presses can be built to include a floating die table.

J-80—Special Machine Control Unit

A saving of as much as 82 per cent in the time required to change tools is reported possible with a new Machine Control Unit announced by the Cross Co., Detroit, Mich. The new unit also reduces scrap and simplifies tool grinding.

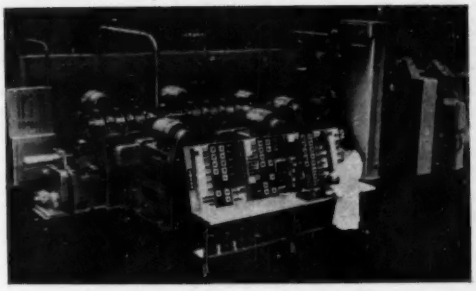
The Machine Control Unit was developed by Cross to reduce indirect labor costs which arise in keeping pace with increased machine speeds, capacities and other mechanical developments. For instance, because the new Cross Transfer-matic uses 83 cutting tools to machine automatic transmission cases, such a large number of tools burdens the operator to the extent that only mechanical means can relieve his keeping account of tools and speeding the changing operations.

Basic components of the Cross Machine Control Unit are a master control board, a master tool setting fixture, a work bench, and Cross Toolometers which automatically shut down the machine when tools need changing.

The control board is divided into sections for each type of tool in the machine. Every section comprises a tool setting gage, a tag with the perishable tool and holder numbers, storage space for two complete sets of tools and holders, and a Toolometer. Alphabetical letters on the board and corresponding ones on the machine heads further group the tools and guide the operator. Colored areas on the control board point out the location of the machine head—yellow indicates a right hand horizontal head, red a left hand horizontal head and blue a vertical head. The tags with the perishable tool numbers provide the operator with on-the-job information for requisitioning worn parts.

Toolometers provide visual records of the used and unused life of every type of tool in the machine. Pointers on the Toolometers index counter clockwise with every machine cycle. When any one of the pointers reaches zero, the machine stops automatically. Red areas on the Toolometer dials, adjacent to the zero marks, represent "danger zones" for the last two hours or other appropriate period of productive tool life.

• PRODUCTION • NEW EQUIPMENT • PLANT •



Cross Machine Control Unit for use with Cross Transfer-matics. (Transfer-matic is Cross name for special machine tools having automatic devices for transferring parts from station to station).

When one of the Toolometers stops the machine, all tools in the "danger zone" are replaced. The Toolometers are then reset by manually turning the pointers clockwise to positive stops which establish starting positions. The stops are adjustable to provide different settings for various types of tools and amounts of work.

All tools are assembled in adjustable holders and pre-set to standard lengths with gages stored in the control board. These are used in conjunction with the master tool setting fixtures attached to the work bench. Then the tools are placed in the control board ready for use when needed. Two sets of tools are provided so that if one tool is damaged during installation, a second one is available and no time is lost in reassembling a new tool.

Time studies show that actual changing of a pre-set tool requires only two minutes compared to seven minutes for a conventional tool change. Added is the economy of changing tools in groups. For example, with ten minutes needed for stopping and starting the machine, down time for changing one pre-set tool is 12 minutes. For ten pre-set tools it is 30 minutes—a saving of nine minutes per tool because of grouping with the Toolometer. The benefits gained, therefore, from the combination of pre-set tools and grouped tool changes with Toolometers may amount to as much as fourteen minutes per tool change, the company points out.

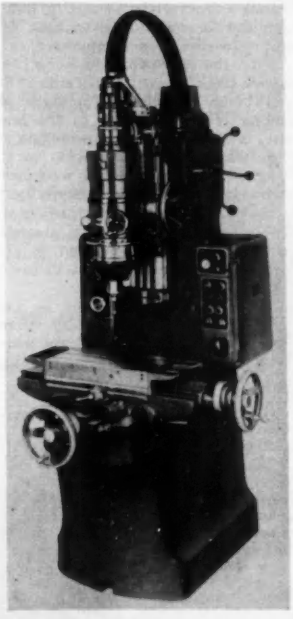
The Machine Control Unit also effects a reduction of scrap and a decrease in time required for tool grinding. Tools systematically replaced do not "lose size" since they are not allowed to operate beyond their normal life expectancy. For the same reason, tool grinding becomes a sharpening instead of a salvaging process. It is unnecessary to grind 1/16 from the end of the tools in order to restore the cutting edge; a few thousands is sufficient when tools are not over-run.

J-81—Contour Jig Grinder

Any contours, regular or irregular, consisting of radii and tangents—as well as straight and tapered holes, can now be ground quickly and accurately with the new No. 2 Model jig grinder developed by the Moore Special Tool Co., Inc., Bridgeport, Conn.

A new angular and indexing device built into the main spindle of the No. 2 Model, and a newly developed slot grinding attachment, now permit this accurate grinding of any contour. More spindle power and infinite feeds up or down make chop grinding of contours possible. This method, in which the wheel contacts only a small part of the work, removes stock very rapidly. Form grinding of die sections is possible with these new features, also.

An infinite range of grinding speeds from 12,000 to 60,000 rpm allows more accurate control of grinding and stock removal. Larger table size and height, coupled with greater power, extend the overall range of grinding operation.

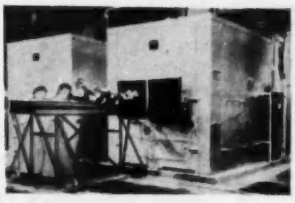


Moore jig grinder, Model No. 2

J-82—Air Drawing Crankshaft Furnace

Two new-type air drawing furnaces for handling crankshafts, but adaptable to other uses, are presented by the Lanly Co., Cleveland, Ohio. Each has capacity for four crankshafts, the load is 2000 lb per charge, and the charge cycle is one hr. A built-in recirculating type gas-fired heating system has capacity of 1,000,000 BTU per hr. and a maximum temperature of 900 F can be obtained.

To assure very uniform operating conditions each crankshaft is placed in an individual cylinder during the treatment process. Heated air at high velocity is supplied to this compartment through jets extending the full length of the cylinder. Dampers control the flow of air in the supply and return openings. A proportioning type potentiometer controller serves to maintain



Lanly air drawing furnace for crankshafts

• PRODUCTION • NEW EQUIPMENT • PLANT •

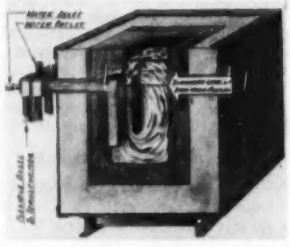
For additional information regarding any of these items, please use coupon on page 62

the temperature at the desired level.

The body is dual panel construction of two 2-in. insulated panels separated by a 2-in. mineral wool blanket.

J-83—Submerged Electrode Salt Bath Furnace

The Ajax Electric Co., Phila., Pa., is offering their Ajax Hultgren salt bath furnace equipped with the new totally submerged electrodes that are recommended for use with salt baths operating at temperatures from 1700 to 2400 F as well as for exceptionally deep baths.



Cross-section of Ajax Hultgren salt bath furnace with totally submerged electrodes

Instead of the electrodes entering from the top of the bath as in standard Ajax practice, they enter through the back wall of the furnace just below the surface of the bath. Closely-spaced to produce electrodynamic stirring action, they assure rapid heating and temperature uniformity within 5 F. The submerged electrodes are so positioned that, should the bath freeze from any cause the salt will shrink sufficiently to expose the electrodes for restarting in a manner similar to the standard Ajax furnace. This is accomplished by melting the salt in the small area between the closely-spaced electrodes. The manufacturer recommends submerged electrodes for deep baths for heat treating long work from 1100 F upward; for the high heat unit used in hardening high speed steel tools at 2200 to 2375 F; for high carbon-high chromium dies at 1850 F; and for all operations carried out in neutral salts above 1700 F such as neutral hardening carbon and alloy steel, annealing and hardening stainless steel, heating for forging and brazing. The standard design, with the electrodes entering from the top of the bath, is used for all other heat treating operations including carburizing, cyanide hardening, austempering, martempering, process annealing, cyclic annealing, solution heat treatment, drawing, descaling, cleaning and desanding.

Use of submerged electrodes for high temperature work greatly extends their life because they are not exposed to the severe oxidizing action taking place at and above the bath surface.

In the submerged electrode furnace the exposed bath surface is reduced to a minimum, namely, the desired working area only. This is said to reduce power consumption as much as 30 per cent on high temperature units.

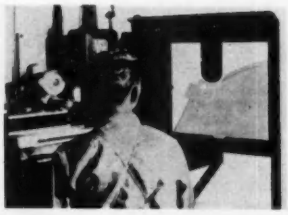
J-84—Triple-Vision Contour Grinder

A "visual-grind" contour grinding machine placed on the market by the Cleveland Grinding Machine Co. of Cleveland, Ohio, now offers three techniques in optical contour grinding—image, profile, and templet—all available in the same machine. Besides avoidance of involved setups, grinding inspection is continuous without frequent reference to a comparator.

First, the company's so-called "Bounce-Back" feature permits "Reflecto-Image" grinding. The light, descending from its source in the lamp house, is condensed onto an oblique reflector which directs the beam to the left against the front of the workpiece. The image is reflected horizontally to the right through an aperture in the reflector, passes through precision lenses for magnification, and is projected on the screen without inversion or reversal.

Second, profile projection is performed by placing an auxiliary mirror behind the work-piece. The light which carries past the work and the grinding wheel is reflected back through the aperture and through the lenses to the ground glass screen. A profile of the work-piece shows as a sharp, dark image on the brightly illuminated screen without indistinct edges.

Third, the templet technique combines both Reflecto-Image and profile projection. A polished precision templet of intended shape is fastened to the front of the work-piece. "Photographs" of both templet and work-piece are projected on the screen simultaneously. The work-piece can then be accurately ground to the desired form by matching its greatly magnified image with that of the templet. The templet readily guides stock removal when wide contours at high magnifications are too large to be drawn on the screen. No drawing need be scribed on the screen.



Cleveland Grinding Machine Co. "Visual-Grind" contour grinding machine combining image, profile, and templet techniques

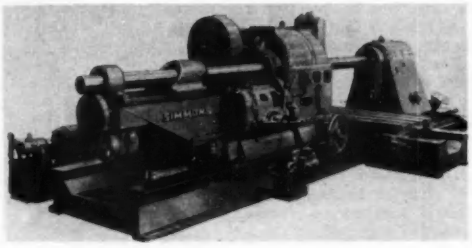
Combining the image, profile and templet techniques, Visual-grind can fill any requirement in the form grinding of tungsten carbide. Moreover, diamond wheel costs are reduced because the form is generated by progressive movements, which are directly controlled and directed by convenient magnification.

Four standing magnifications are available. Capacity is 6 in., 16 in., 18 in. high, using 7 in. wheel.

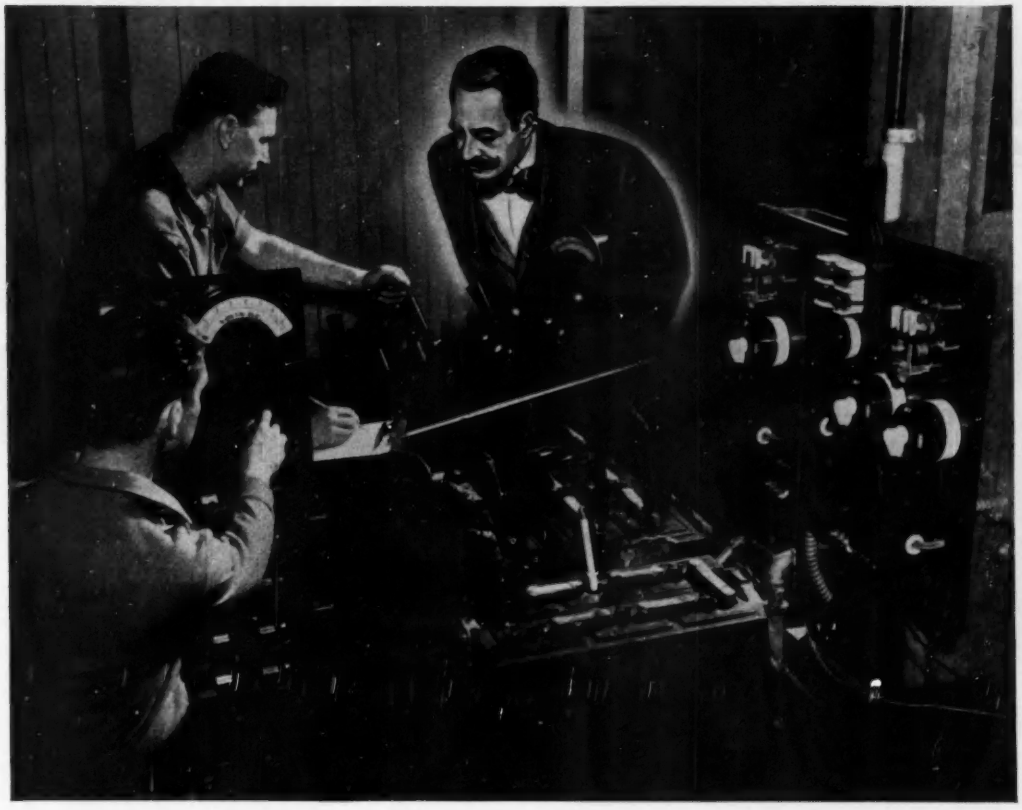
J-85—Boring and Facing Machine

A new 6 in. bar horizontal boring and facing machine for all types of cylindrical work, developed by the Simmons Machine Tool Corp., Albany, N. Y., is said to be suited for Diesel engine build-

(*Turn to page* 76, *please*)



Simmons single unit 6-in. bar horizontal boring and facing machine, with hydraulic cross table



This overcharge test, Mr. Diesel, proves that Exides can "give it and take it"

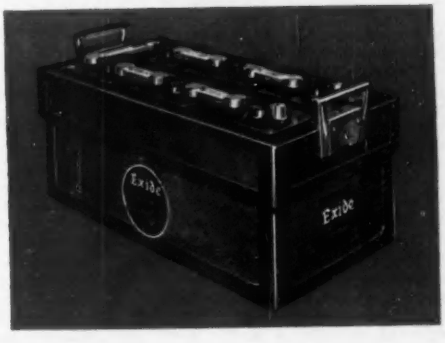
The Exide overcharge test is rough and rugged. Plates and separators are subjected to *continuous* overcharge . . . not for a short time, but as long as 48 weeks, and at an average temperature of 100° F. The purpose: to *make certain* that Exide Batteries give you maximum service life.

Results of this and other tests prove that you can count on Exide Diesel Cranking Batteries for:

- high maintained voltage—a *quick breakaway* and *high cranking speeds.*
- long life—low depreciation, less frequent replacements.
- low costs—operating, maintenance, repair.
- ruggedness for heavy-duty service in all climates.

Get top performance, long battery life and economy with Exide Batteries. Use them for all your Diesel cranking—buses, trucks, trailer-tractors, off-the-highway equipment, ships, power plants, Diesel-electric locomotives.

LET EXIDE'S ENGINEERING STAFF, the largest in the industry, help you find the right answer to any Diesel cranking problem.

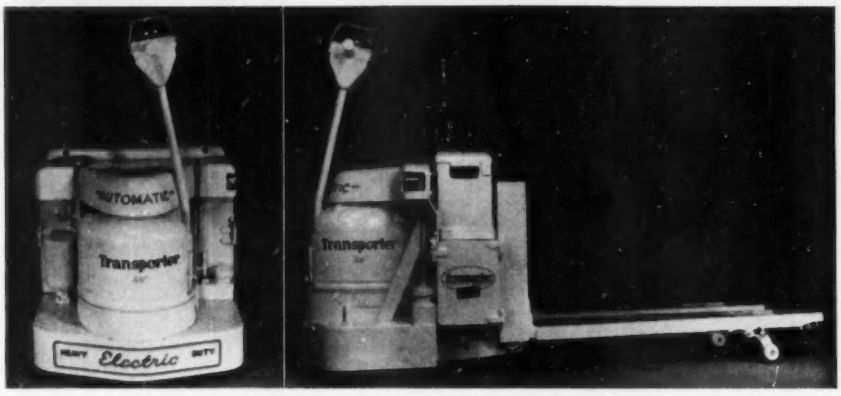


THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 32
Exide Batteries of Canada, Limited, Toronto
"Exide" *Reg. Trade-mark U. S. Pat. Off.*

1888 . . . DEPENDABLE BATTERIES FOR 62 YEARS . . . 1950

NEW PRODUCTS

FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 62



Shorter, lower, completely re-engineered Transporter "101" of the Automatic Transportation Co. will be available in 4,000 and 6,000 lb capacity models in either pallet or platform type. Everything but lowering is controlled from the handle — forward, reverse, steering, and brake. Improved drive unit and better weight distribution permit handling of overhanging loads without undue stress on the axle.

K-141—Redesigned Electric Industrial Truck

In completely redesigning and re-engineering its Transporter driver-led electric industrial truck, the Automatic Transportation Co., Chicago, Ill., has introduced the Transporter "101" having a completely cast drive housing replacing the old 20-gage steel one, a streamlined cast collector ring cover bolted to the frame, a solid steel enclosure for protecting the battery; and for increased maneuverability—a foot shorter length in the pallet model, and a five and one-half in. shorter length in the platform model.

Major length reduction results from making the power unit cylindrical instead of rectangular, permitting it to turn in its own area without requiring additional space for clearance. The truck can be operated with handle upright in both speeds, forward and reverse—saving another foot in tight quarters.

The newly designed field-tested motor is rated 20 per cent more efficient than its predecessor. The motor gear drive unit with first reduction chain, second reduction spur gear, fully enclosed, replaces a double reduction chain drive. The "101" cannot be started in second speed, assuring starts that are smooth since first speed must be used first.

The Transporter "101" is lower by 5½ in., to lower the center of gravity and reduce load swaying. More effective braking is secured with brake now on the motor shaft, braking through the entire gear reduction. For operators who ride the Transporter the bumper is a deep-sectioned heavy-duty platform type with non-skid plate, adding solidity and safety.

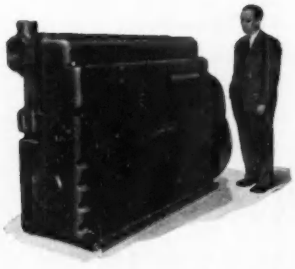
A finger-tip lever replaces the old lowering handle, eliminating former broken lowering arms when the operator applied excessive pressure. Wider helper rollers at the rear ease entrance into lightly loaded pallets. Drive tires are larger than before. Cushion-type tires can be used. Steel load wheels are available.

K-142—Heavy-Duty Diesel Engine

Brought out by the Ingersoll-Rand Co., New York, N. Y., a new type Diesel engine in the 195-375 hp range, designated the TS Diesel, is declared to provide a previously unattainable combination of characteristics. The TS Diesel is stated to be easily made portable, though not of the automotive-type; it is small in size, but with big-engine design; light in weight, but with moderate speed; powerful, but with low exhaust temperature; and perfectly balanced, but with no balancing devices. It is a four-cycle, 7-in. bore, 8½-in. stroke, single-acting engine with a weight of about 30 lbs per hp, and a fuel consumption of 0.40 lbs per hp-hr.

Heretofore available only in much larger stationary Diesel units, the cylinders of the TS Diesel are provided with replaceable, wet-type liners and individual heads with overhead valves and intake and exhaust valve-seat inserts. The thick-wall, long-skirt pistons are of aluminum alloy, with ventilated oil-scraper rings above and below the full-floating piston pins. The perfectly balanced crankshaft is short and unusually strong, with a 5¼ in. diam at both crankpin and main bearings, eliminating torsional vibration without use of dampers.

Both the main and crankpin bearings are provided with aluminum alloy, full-floating, interchangeable shells. Camshaft, blower, water pump and lubricating-oil pump are all gear-driven from the flywheel end of the machine, permitting power take-off from either end. Individual fuel injection pumps serve each cylinder, with two, single-



Ingersoll-Rand heavy-duty TS Diesel engine

Faster Ditching...Greater Versatility

BUCKEYE 406

GENERAL UTILITY DITCHER

Another Cost-Cutting Application of

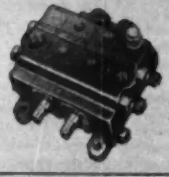
VICKERS HYDRAULICS

The Model 406 is a prominent member of the family of Buckeye Ditchers described as providing "The Most Ditch for the Least Money." It has a reputation for fast digging, stamina and versatility. The telescoping boom provides digging depths down to 6′ to 8′; cutting widths are from 17″ to 24″. Being exceptionally compact, the 406 works in close quarters as well as in the wide open spaces.

Vickers Hydraulics has an important part in the performance of the 406. The boom hoist is driven by a Vickers Hydraulic Motor which provides positive control at all times . . . boom cannot float or sink in ditch. Raising or lowering of boom is easily accomplished. Another Vickers Hydraulic Motor quickly shifts the conveyor from the extreme position on one side of machine to the other (or any intermediate position). When working under close or irregular conditions, this feature is invaluable in gaining clearance. The Vickers Pump shown also supplies power for the hydraulic brakes.

Vickers Hydraulics improves the operation of a great variety of construction machinery. Get in touch with the nearest office for information and data on Vickers hydraulic equipment designed and built expressly for construction machinery and information on other cost-cutting applications.

Vickers Double Pump consists of two vane type pumps driven from same shaft . . . providing power for two separate hydraulic circuits. Exclusive "hydraulic balance" construction assures longer pump life.



Vickers Sectional Type Multiple-Unit Valve is available in many combinations for convenient and selective control. Includes relief valve for overload protection.

Vickers Gear Type Hydraulic Motor has complete hydraulic balance (both radial and axial) that eliminates pressure loads, thus providing longer life, higher operating efficiency, greater practical operating pressure.

VICKERS Incorporated

DIVISION OF THE SPERRY CORP.

1428 **OAKMAN BLVD.** • **DETROIT 32, MICH.**

Application Engineering Offices: ATLANTA • CHICAGO • CINCINNATI • CLEVELAND • DETROIT • HOUSTON • LOS ANGELES (Metropolitan) • MILWAUKEE NEW YORK (Metropolitan) • PHILADELPHIA • PITTSBURGH • ROCHESTER ROCKFORD • ST. LOUIS • SEATTLE • TULSA • WASHINGTON • WORCESTER

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

4142

NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 62

hole, non-clogging nozzles per cylinder. The engine is full-pressure lubricated throughout, and is equipped with a gear-driven mechanical supercharger which supplies air for increasing initial pressure in the cylinders and for scavenging during the latter part of the exhaust stroke. Normal starting is by 250-psi air admitted to all cylinders in turn through a starting-air distributor.

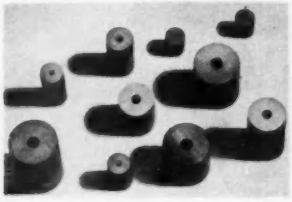
The TS Diesel mounts either on a concrete base; or for portability, on welded-steel skids. In production in 6 or 8 in-line cylinder designs, the Diesel is capable of delivering 195 to 375 hp at 900 to 1000 rpm.

K-143—Optical Comparator Illuminating Unit

High intensity illuminating unit now being supplied by Jones & Lamson Machine Co., Springfield, Vt., on all Jones & Lamson Model BC-14, PC-14 and PC-30 optical comparators provides increased screen illumination, particularly at high magnifications. Shadow outlines are made even sharper and improved contrast affords highly accurate readings with less effort. Photo shows complete unit mounted on a Model PC-30 pedestal type optical comparator. Upper portion of the unit carries a 10 volt bulb, a condensing lens and a colored filter. Lower box section houses a small centrifugal-type electrically driven blower. Method of clamping the unit on the base and also the blower exhaust hole is shown. The cooling unit operates when the lamp switch is turned on and draws a constant stream of air through the meshed port at the top of the lamp house. This stream of air passes down around the bulb, through the lamp house base into the blower, whence it is exhausted through the vent on the side of the lower housing. Entire lamp assembly is held at a constant normal temperature.

K-144—Die Nibs of Cemented Carbide

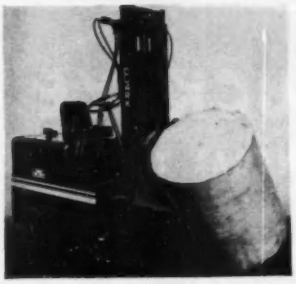
Die nibs of cemented carbide for heading bolts, screws, etc., are included in rough cored form as part of the line of standard stock items now supplied by Carboloy Co., Inc., Detroit, Mich.



Carboloy standard header die nibs of cemented carbide

The standard header die nibs are available in 17 sizes ranging from 9/16 in. O.D., ¾ in. long, and having a cored hole size of 0.060 in., to 1¼ O.D., 2⅛ in. long, and having a cored hole size of 0.330 in. The seven smaller sizes are stocked in Carboloy Grade 55B; the 10 larger sizes in Grade 190.

K-145—Rotating Clamp Device



Clark rotating clamp device for roll materials

A detachable rotating clamp device simplifying handling of paper and other roll materials is offered by Clark Equipment Co., Battle Creek, Mich., for use on all gas and electric carloader model fork-lift trucks with standard rated capacities of 3000 to 5000 lbs. The attachment has two basic actions—clamping and rotating. Rolls may be handled in either vertical or horizontal position, and changed from either position to the other. A roll can be rotated at uniform speed through 90 deg. Both clamping and rotating actions are accomplished hydraulically; and a supplementary load accumulator, hydraulically actuated, serves to prevent loss of clamping pressure. Rubber-covered clamping arms adjust in three positions for handling loads of varying diam.

(*Turn to page* 60, *please*)

F-Type Cylinder Heads

(*Continued from page* 48)

tion, special T.C.T. cutters are used with a special full floating holder of our design. This holder and cutter locates over the pilots, which were previously inserted, and machines the seats to within 0.008 in. of depth.

(8) Grind Valve Seats on a new four-spindle Waterbury valve seat grinder.

The casting is again located in the same manner and clamped. With the pilots still in place in the valve guides, the grinding wheel and holder locate over these pilots and grind the valve seats.

(9) Wash and Clean. After the seats are ground, the pilot pins are removed and the casting is sent through a new Schmieg industrial washing machine, which is a 12-station, rotary index type. The castings are then taken from this washer and moved down the conveyor to an automatic turnover fixture where two Welch plugs are assembled and set. Before the casting is unloaded from this fixture, pipe plugs and Welch plugs are set in the top side.

(10) Test for Leaks. The casting is then unloaded from the fixture and is rolled down the conveyor to the two water test fixtures.

The first test is for leaks in the manifold chamber, an integral part of the cylinder head. This is performed by sealing all openings mechanically, and submerging the casting for one minute in a tank of soluble oil, heated to a temperature of 100 F, with an air pressure of 55 psi inside the manifold chamber. A time delay relay connected in the circuit insures the one-minute limit.

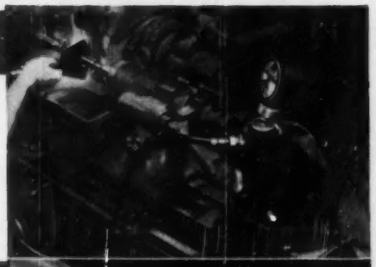
The same procedure is then followed for testing the water jacket in the second testing fixture.

After the water test operation the parts are submitted to final inspection, and after being thoroughly checked, are placed on an overhead conveyor which carries them to the engine assembly line where they become a part of the Hurricane F-head engine.

3 NEW AIR-O-LIMIT DEVELOPMENTS

for Increased Speed and Greater Accuracy

Air-O-Limit Snap Gages

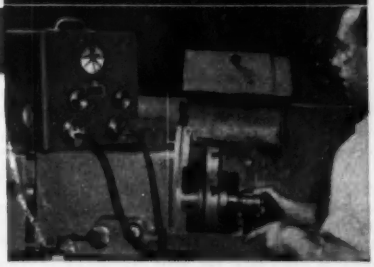


The design of the new P&W Model F Air-O-Limit Snap Gage provides unusual interchangeability and flexibility for checking work in the machine and in the inspection department. With four different frames and one set of adjustable carbide anvils, diameters ranging from ½" to 2½" can be quickly and easily checked.

Contact Gaging Plugs

The new P&W Air-O-Limit Contact Gaging Plug has been developed for checking diameters where the roughness of the bore surface finish does not permit accurate readings with regular air gaging plugs. Its easy-entry bullet nose design and a *unique design feature which provides adjustment for setup and wear of the carbide contact gaging buttons* give greater accuracy of measurement and insure long satisfactory performance.

Duplex Indicator



The new P&W Air-O-Limit Duplex Indicator permits two station gaging with greater speed and accuracy. This P&W development incorporates *in one meter* two independent gaging indicators with individual pointers thus permitting dual readings on the same dial. P&W Duplex Indicators can be applied to many multiple station gaging fixtures.

PRATT & WHITNEY

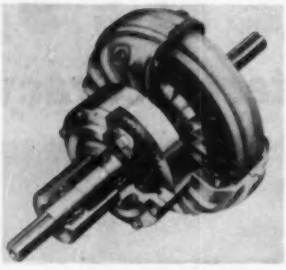
Division Niles-Bement-Pond Company
WEST HARTFORD 1, CONNECTICUT

It pays to buy
GAGES
on a performance basis

NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 62

K-146—Hydraulic Conversion Unit



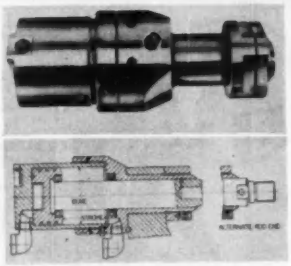
Twin Disc Hydro-Sheave drive

A hydraulic-conversion unit, especially for small electric motors and internal combustion engines of ¾ to 25 hp, is a product of the Twin Disc Clutch Co., Rockford, Ill. This Twin Disc Hydro-Sheave drive is a complete, easily-installed transmission unit, available in five sizes, and said to afford all the advantages of fluid drive, at low cost.

The Hydro-Sheave drive slides over the motor or engine shaft where it is held in place by three setscrews. The unit is then ready for immediate use. Filled with hydraulic fluid, and having anti-friction bearings lubricated for life, the unit is said to present no alignment problems with the engine or motor. Advantages of fluid drive are cited as smoother flow of power, protection against overload and stalling, full torque at all speeds, and uniform acceleration. Additionally, the size of the power unit used can be based on the running load instead of on the starting load.

K-147—Hydraulic Cylinders

Hannifin Corp., Chicago, Ill., offers a standardized line of "Hy-Power" hydraulic cylinders built especially for push stroke applications using up to 5000 psi pressure. Cylinders are for use in combination with Hannifin's "Hy-Power" generator, which supplies pressure up to 1000 psi for approach and return strokes, then automatically multiplies pump pressure by five for the power stroke.



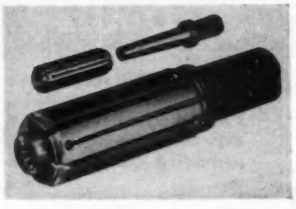
Top—Exterior of Hannifin 50-ton capacity "Hy-Power" hydraulic cylinder. Bottom—Cross-section view

The cylinders are available in nine sizes ranging from 2 in. to 7¼ in. bore diam and with strokes up to 6 in. on largest sizes. Output force on push applications ranges from 7½ to 100 tons with 5000 psi hydraulic pressure on the head end of the piston.

The piston is a floating type with ground, precision step-seal rings. Cylinder body is heat treated alloy steel with precision ground bore. The piston rod is alloy steel, case hardened, and ground. The rod moves through an alloy steel, heat treated, precision gland bearing fitted with self-adjusting packing. The high pressure end of the cylinder is of one-piece construction requiring no sealing.

"Hy-Power" cylinders are suitable where space is limited and high output force is needed, as in riveting, punching, and pressing operations. The design provides for simple lock nut mounting in yoke or frame.

K-148—Expanding Mandrel



Precision expanding mandrel revealed by the Western Tool and Mfg. Co., Inc., Springfield, Ohio, is for use on lathes, shapers, planers, grinders and milling machines, and is made in two parts from oil-hardened tool steel. The sleeve moves on the arbor to provide a range of only 0.010 in. It closes at 0.003 in. under and opens at 0.007 in. over nominal size, with a positive stop on the arbor to prevent overstrain of the sleeve. Tolerances are held to less than 0.0001 in. run out. Mandrel is made in standard sizes from ½ in. through 3 in. diam, graduated by 1/16 in.

(*Turn to page* 88, *please*)

Versatile Hydraulic Presses

(*Continued from page* 33)

cleanly designed unit. Actually, the weight was cut in half. Should this type of radiator be damaged, the steel parts can be repaired in the field by welding or straightening. The casting-to-stamping change has made possible savings as high as 30 per cent for the company, which states that in addition to time savings, production problems have been simplified and a better product is made available.

A 450-ton single-action E. W. Bliss Co. hydraulic press, installed for stamping necessary units for the new radiator, is also used for other parts manufacture. Flexibility, use of the outside cylinders for jobs up to 175-tons pressure, availability of full 450-ton pressure, ability to accommodate off-center loads, quick advance and return, and inching for die-setting are some of the hydraulic press features.

Designed especially for use in the Young plant, the press shown here was made to cover a wide range of applications. Beneath the ram there is a specially made spacer with T slots for engaging most of the dies used. This spacer, however, may be readily changed by removing 10 cap screws from the ram face and inserting other spacers of proper dimensions for the varied requirements. Ability of the press to operate with two sets of pumps —175-tons and 450-tons—is very useful in meeting the needs of radiator manufacture.

Another hydraulic press user is Charles T. Brandt, Inc., Baltimore, steel product manufacturer. At the front of the main Brandt production line, there are two double-action Lake Erie Engineering Corp. hydraulic presses; one press is rated at 407-tons and the other at 800-tons.

With both presses in operation, the plant is capable of producing stampings for up to 75 complete trucks per day in a single shift. However, this daily output is not required, so the presses are employed for other work. Advantages of hydraulic presses for this type of work are the ease and speed with which they can be set up or changed from one job to another. Presently producing truck parts for one of the Big Three automobile manufacturers, Brandt normally turns out stampings for about 1000 trucks per month.

Only **ONE** *can bear this famous name!*

Copying the Spicer Universal Joint appearance is easy enough. And commonly done. But no one else can put *into* a joint the priceless combination of ingredients, know-how and lore that makes the Spicer unit so individual . . . so exclusive in features . . . so outstanding in performance.

No other universal joint has behind it the 46-year experience of Spicer. No other engineering staff is so generously manned with competent joint-designing skill. No plant has such a big investment in universal joint production and testing equipment as Spicer. With so many features that cannot be duplicated, is it any wonder that Spicer Universal Joints are the "Standard of the Industry?"

46 YEARS OF **Spicer** SERVICE

SPICER MANUFACTURING
Division of Dana Corporation
TOLEDO 1, OHIO

TRANSMISSIONS • PASSENGER CAR AXLES • CLUTCHES • PARISH FRAMES • RAILWAY GENERATOR DRIVES
STAMPINGS • FORGINGS • TORQUE CONVERTERS • UNIVERSAL JOINTS • SPICER "BROWN-LIPE" GEAR BOXES

Publications AVAILABLE

New Industrial Literature listed in this department is obtainable by subscribers through the Editorial Department of AUTOMOTIVE INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

H-133 Exhaust Valve Rotation

E. I. du Pont de Nemours & Co., Inc., —A new bulletin just published contains much of the general information available on exhaust valve rotation. It has been compiled to acquaint those responsible for engine maintenance with three useful mechanical devices for improving exhaust valve life. These devices are available as either original equipment or replacement parts for a large number of engines as shown in a table in the bulletin.

H-134 Air and Hydraulic Power

Rivett Lathe & Grinder, Inc.—A new booklet describing the application of air and hydraulic power is devoted to showing a number of circuit diagrams indicating how air and hydraulics may be efficiently applied to industrial equipment. The booklet provides a more complete understanding of air and hydraulics and the many possibilities of using these types of power.

H-135 Iron Annealing Furnaces

Holcroft & Co.—A new bulletin on Malleable Iron Annealing Furnaces has been issued. It contains photographic illustrations, sectional drawings and descriptions of malleable annealing furnaces recently engineered and built by the company. Illustrated also and described is the Low-Hydrogen Gas Generator.

H-136 Lathes

Hardinge Brothers, Inc. — Bulletin HL contains complete illustrations and specifications on the new Hardinge 10-in. General Purpose Lathe. Features of the lathe illustrated and described in the bulletin are Independent Variable Electric Feed; Precision Gear Box and Lead Screw, and Solid and Hardened Dovetail Bed Ways. A number of illustrations in the bulletin show setups of the machine for various work conditions.

H-137 Materials Handling Equipment

Lyon-Raymond Corp. — A new 4-page, 2-color booklet describes the company's new Riding Type SpaceMaker Electric Tiering Truck. Three models are covered in the bulletin. Complete specifications of all the various models are listed and discussed in detail, together with the descriptions of many applications.

H-138 Lubrication

Alemite Div., Stewart-Warner Corp. —"Eleven Ways to Cut Production Costs" is the title of a pocket-sized primer on industrial lubrication. Eleven examples of production or machinery expense economies, attained through modern handling and application of greases and oils, are presented in the booklet.

H-139 Industrial Coated Fabrics

Vulcan Proofing Co.—Just issued is a new catalog detailing a wide range of rubber and synthetic rubber coated fabrics. Many new fabrics and new coatings are featured in the catalog.

(*Turn to page 74, please*)

TIME SAVER COUPON

THIS TIME SAVER COUPON is for your convenience in obtaining, WITHOUT OBLIGATION, more information on any one or more of the publications described above OR New Production and Plant Equipment OR New Products items described on other pages.

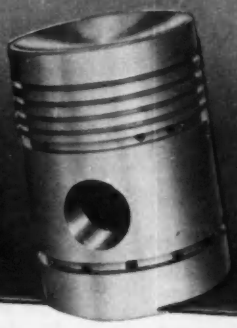
Readers' Service Department,
Automotive Industries,
Chestnut & 56th Sts., Philadelphia 39, Pa.

Please send me: **These FREE Publications** (Use letter and designating number of each item desired)	*Please send me more information on:* **New Production and Plant Equipment** (Use letter and designating number of each item desired)	*Please send me more information on:* **New Products** (Use letter and designating number of each item desired)
....	....	....
....	....	....

Your Name ..... Your Title .....

Your Company Connection or Business .....

Address ..... (Street & No.) (City) (Zone) (State)



Air Craft

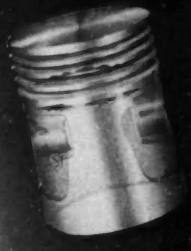
Diesel

Every Type Aluminum Piston ... *One* Standard of Quality

STERLING

Leaders in Aluminum Pistons for 30 Years

Sterling Engineers will work with you as they have with other leading manufacturers in developing pistons to meet your exacting requirements. Wire or phone.



Wing Insert

Two Cycle

Steel Truss

Turbulator head

T-Slot

Trunk Type

STERLING ALUMINUM PRODUCTS INC.

ST. LOUIS, MO.

Effects of Mechanical Octane Numbers

(*Continued from page* 45)

dex of isooctane for squish pistons is shown in Fig. 6. The imep ratio of 80 per cent D.I.B., Fig. 7, versus compression ratio and rpm for squish pistons shows that both compression ratio and rpm are engine severity factors.

Fig. 8 shows the effects of turbulence in terms of per cent gain in density index for the 7.3 compression group. This graph is somewhat complex and difficult to follow but shows the gain for each type of turbulence over a range of rpm and for both isooctane and 80 per cent D.I.B. The base is the flat top piston with standard intake valve and gains due to shroud, to squish, and to shroud and squish together can be seen. For each speed and for each fuel the value with the flat top piston and standard intake valve is 100 per cent. It will be noted that the gains for 80 per cent D.I.B. are greater than they are for isooctane.

Since its introduction in 1934 the Aetna T-type clutch release bearing has enjoyed the pronounced and uninterrupted preference of the majority of America's car, truck, bus and tractor manufacturers. Its impressive record stems from these vital and unique features which end all the troubles common to conventional type bearings:

- prelubricated for life—designed with exceptionally large grease reservoir, factory packed with the best lubricant obtainable.
- permanently concentric—patented, one-piece T-type retainer locks balls and races in perfect alignment, eliminates eccentric thrust, noise and excessive wear.
- oil-filled bronze retainer—improves lubrication, assures the extra smoothness, quietness and endurance of bronze-to-steel contact.
- time proven—service tested for 16 years under every conceivable operating condition encountered by automotive vehicles.

Write for complete information and testings samples.

AETNA BALL AND ROLLER BEARING COMPANY
4600 Schubert Ave. • Chicago 39, Illinois

Aetna

In Detroit: SAM T. KELLER, 2457 Woodward Avenue

T-TYPE Clutch Release BEARINGS
WITH THE ... T ... THAT TAMES TROUBLE

Effects of Cylinder Temperature and Intake Air Temperature

The cylinder is decidedly sensitive to the effects of temperature and particularly so in the case of the diisobutylene blends. Increasing jacket water temperature at the cylinder base while maintaining it at low temperature in the cylinder head had significant effects in increasing the tendency to knock.

Effects of Spark Advance

Spark advance had very pronounced effects on knock. The relative performance of diisobutylene blends in terms of primary reference fuels varied very widely with spark advance. Thus, an octane number of a diisobutylene blend is only significant for the particular spark advance used to obtain the rating.

Effects of Fuel-Air Ratio

Fuel-air ratio had relatively slight effects upon the knocking tendency of the primary reference fuels, but very sensitive diisobutylene blends were, however, markedly affected by fuel-air ratio, and an octane number of such blends must be qualified by the fuel-air ratio used in the rating. It was demonstrated that for sensitive fuels, mixture enrichment offers a useful and practical method of reducing or eliminating knocking.

Combination of Effects Producing Engine Mildness

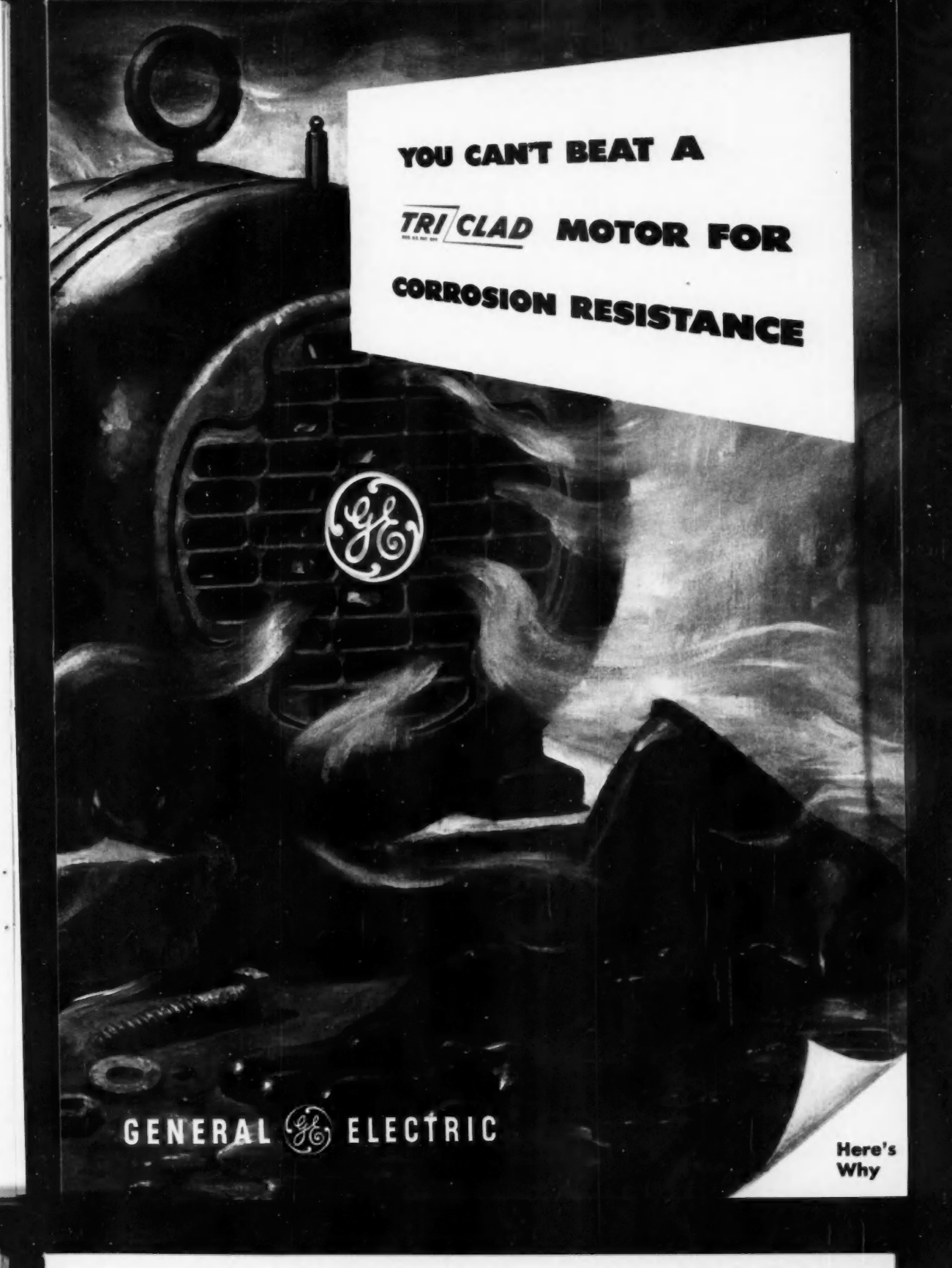
The combination of reduced temperature of jacket water and intake air with a spark retard producing a 2 per cent drop from maximum power was found to be extremely effective in respect to octane number requirements and increased the density index of isooctane by 20-25 per cent and that of 80 per cent and 100 per cent diisobutylene by 50-90 per cent.

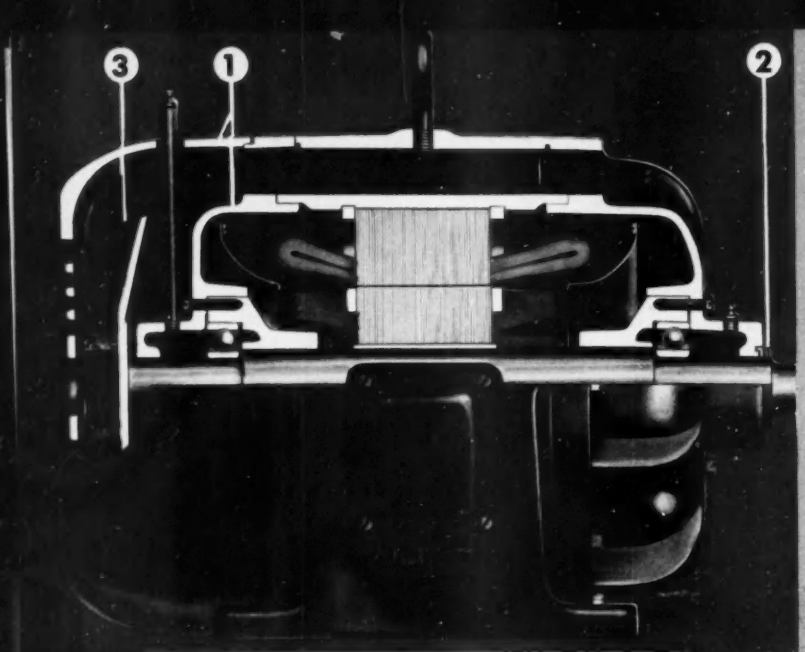
Miscellaneous Knocking Effects

Exhaust valve temperature is often considered to be a major cause of knocking in poppet valve engines. The 27 cylinder was equipped with a sodium-cooled valve as standard, and this valve was replaced with a solid valve of identical external dimensions. No difference in knock limited density indices of isooctane or 100 per cent D.I.B. could be detected as a result of reduced exhaust valve cooling.

Tests were carried out at 30 to one compression ratio with a flat top piston and a shrouded valve. At a manifold pressure of 7.2 in., heptane, 40 octane-60 heptane, isooctane, isooctane + six cc lead, triptane + four cc lead and

(*Turn to page* 67, *please*)


YOU CAN'T BEAT A
TRI CLAD MOTOR FOR
CORROSION RESISTANCE
GENERAL ELECTRIC
Here's
Why



Here's the totally enclosed Tri-Clad double-shell structure (1) that locks out dirt, flying metal chips, abrasive dust and corrosive fumes. Check the rotating labyrinth seal (2) which prevents foreign matter from working in along the shaft. Note the cast-iron housing, the corrosion-resistant G-E Textolite* material cooling fan (3). Fan circulates cooling air between the shells—no contaminated air touches the punchings or inside parts.

You can't beat TRI/CLAD motors for corrosion resistance

Acid fumes, alkali dust, dye-house vapors, tropical weather – you name *your* motor "poison." You just can't beat Tri-Clad cast-iron construction for corrosion resistance.

Rolling up 6 billion hours of service on all kinds of jobs, more than 1,876,000 Tri-Clad motors tell the eye-opening story of cast-iron motor structure. You get an inherent damping action that minimizes noise and damaging vibration. You get rigidity that makes for permanent shaft alignment. (Try bolting a Tri-Clad motor to an uneven surface – the bolt will snap before you can twist the rigid frame out of line.) You get extra protection against jarring blows and rough handling. You get resistance to rust and corrosion that is not approached by any other metal used for standard motor construction today.

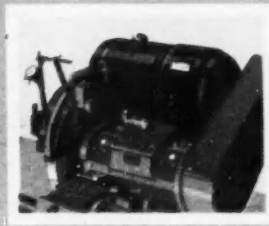
WANT MOTORS THAT STAY ON THE JOB ANYWHERE? There's a stock of Tri-Clad motors near you, in nearly all types and ratings, ready for **IMMEDIATE SHIPMENT**. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

*Reg. U. S. Pat. Off.
(standard on popular sizes)

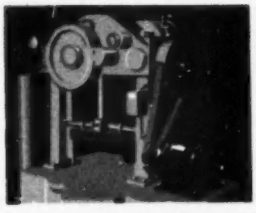
GENERAL ELECTRIC

YOU CAN'T BEAT TRI/CLAD EXTRA PROTECTION

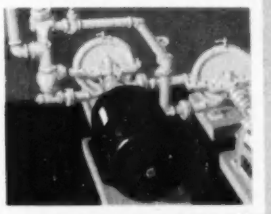
G-E capacitor motors for use on fans, blowers, pumps and compressors with single-phase power. From ¼ to 5 hp.



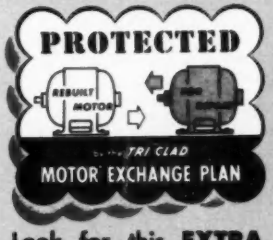
G-E Type ACA induction motors for adjustable speeds—provide speed ranges from 3-1 to 20-1. From 3 to 75 hp.



G-E open (dripproof) induction motors for constant-load, constant-speed applications. From 1 to 2000 hp.



G-E totally enclosed motors for outdoor operation, in abrasive dusts, or corrosive fumes. From 1 to 1000 hp.



Look for this **EXTRA** on the motor you buy!

benzene, all gave a sharp clear knock and all except heptane gave a clean cut on the ignition switch. Reducing the manifold pressure by one in. gave a clean ignition cut with heptane. The piston was then modified to a squish type of 21.3 compression ratio. At 21.3 compression ratio the engine gave a density index of 15.2 for isooctane at 1200 rpm and an index of 14.2 for 80 O.N. Thus, at 21.3 compression ratio there is almost no octane number response between 80 and 100 octane number.

Effects of Compression Ratio on Volumetric Efficiency

No effects of compression ratio which are significantly outside the limits of experimental error in measuring volumetric efficiency were detected in the 27 cylinder. Fig. 9 shows imep volumetric efficiency and relative thermal efficiency in terms of air versus rpm for the 10.1 compression ratio squish piston with standard intake valve. This figure shows that estimation of volumetric efficiency from imep is somewhat unreliable. It also shows poor relative thermal efficiency in terms of air at low rpm.

Conflict of Findings

Rothrock and co-workers at the NACA were, so far as the authors know, the first to introduce the concept of relating combustion chamber air density to knocking. Evvard, Branstetter, Alquist and O'Dell of NACA have shown that the limiting factor for isooctane is the combination of charge density and compression temperature and that as the temperature increases the knock limited density decreases. They show that it does not matter whether the temperature results from compression ratio or from intake temperature.

The presently reported work is in conflict with the findings of Evvard et al since it was found that for isooctane at 1200 rpm and constant intake temperature, the knock limited true air density is independent of compression ratio over a compression ratio range of 5.7 to 15.0 to one. It has been computed that the compression temperature is nearly 600 F higher at 15 to one compression ratio than it is at 5.7. While tests made with the 27 cylinder show that the knock limited true air density of isooctane at 1200 rpm is independent of compression temperature produced by compression ratio they also show that increase of compression temperature produced by increased intake temperature has a marked effect in reducing permissible density.

It should be noted that the design of the 27 cylinder attempted to take in too much territory in covering a compression ratio range of 5 to 30. The result is that the cylinder at any compression ratio is inferior to a cylinder designed specifically for that ratio.

The foregoing article is a condensation of a paper — *Cylinder Performance, Compression Ratio, and Mechanical Octane Number Effects*, by *S. D. Heron*, Consulting Engineer, and *A. E. Felt*, Research Engineer, *Ethyl Corp.*— which was originally presented at the recent SAE National Passenger Car, Body, and Production Meeting in Detroit.

BOOKS . . .

THE THEORY AND DESIGN OF GAS TURBINES AND JET ENGINES by *E. T. Vincent*, published by *McGraw-Hill Book Co.*, New York, N. Y. The subject is introduced with considerable review material on thermodynamics, principles fo gas flow, jet propulsion, and the principles of rotating machines. A fresh approach has been achieved by arrangement of chapters in such fashion that theoretical material is given in one chapter, followed by a chapter in which the theory thus developed is applied to specific design considerations. This treatment lends itself to engineering courses since it is feasible to confine a course to theory alone by using selected chapters; and follow later with a course on design. It is of interest that the author emphasizes the reasons for the departure of actual machines from the dictates of simpler theory, outlining the limitations imposed by design and materials as well as gas flow.

70 years of spring designing and manufacture have given Tuthill unique "know-how." Tuthill engineers are constantly developing springs designed for specific needs as widely varied as power shovels, overland buses, farm wagons and third-axle heavy jobs.

Your Requests for Quotations or Engineering Service will Receive Prompt Attention

TUTHILL SPRING CO.

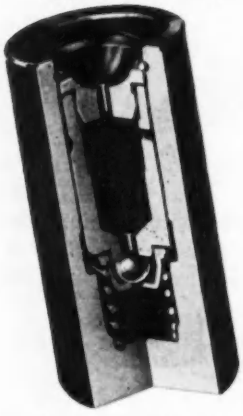
760 WEST POLK STREET • CHICAGO 7, ILLINOIS

Tappet Noise

with

HYDRAULIC VALVE LIFTERS

Use Hydraulic Valve Lifters in your engine to put a stop to tappet noise and gain these five additional advantages . . .



1. Elimination of valve clearance adjustments.
2. Longer valve life.
3. Smoother engine performance.
4. Absorption of cam tolerances and runouts.
5. Automatic compensation for expansion and contraction of engine parts.

Let us tailor a Hydraulic Valve Lifter to your present or future automobile or truck engine design. Our current production rate is more than sixty-five thousand units a day.

Read the complete story of our Hydraulic Valve Lifters in this bulletin designed especially to inform automotive executives.

DIESEL EQUIPMENT DIVISION

General Motors Corporation

GRAND RAPIDS, MICHIGAN

Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE INDUSTRIES.

General business activity declined slightly during the week ended May 6. Electric power production, railway freight loadings, bituminous coal production, and construction were lower than in the preceding week, while department store sales and crude oil output increased. The *New York Times* index of activity for the week ended May 6 stands at 158.1, as compared with 158.8 in the preceding week and 145.9 a year ago.

Sales of department stores during the week ended May 6, as reported by the Federal Reserve Board, were 300 per cent of the 1935-39 average, as compared with 285 in the week before. At this level, the volume of sales was 10 per cent less than in the corresponding week of last year. The total reported since the beginning of the year was three per cent below the comparable sum in 1949.

Electric power production declined more than seasonally during the week ended May 6. Output, however, was 11.1 per cent above the corresponding amount in 1949, as compared with an advance of 11.3 per cent shown for the preceding week.

Railway freight loadings during the same period totaled 744,040 cars, 0.2 per cent less than the figure for the week before and 3.2 per cent below the corresponding number recorded in 1949.

Crude oil production in the week ended May 6 averaged 5,058,480 barrels daily, 44,500 more than in the preceding week and 105,180 above the comparable output a year ago.

Production of bituminous coal and lignite during the same week is estimated at 10,770,000 net tons, 345,000 less than the output in the week before and 169,000 below the corresponding quantity in 1949.

Civil engineering construction volume reported for the week ended May 11, according to *Engineering News-Record*, was $183,343,000, or 27 per cent less than the preceding weekly figure but 40 per cent above the comparable sum in 1949. The total recorded for 19 weeks of this year was 44 per cent more than the corresponding amount in 1949.

The wholesale price index of the Bureau of Labor Statistics during the week ended May 9, at 154.9 per cent of the 1926 average, was 0.3 per cent more than in the preceding week but was 0.3 per cent below the corresponding figure in 1949.

Member-bank reserve balances declined $79 million during the week ended May 10. Underlying changes thus reflected include a decrease of $214 million in Reserve bank credit and an advance of $31 million in non-member deposits and other Federal Reserve accounts, accompanied by declines of $10 million in money in circulation, $8 million in Treasury cash, and $145 million in Treasury deposits with Federal Reserve banks.

Total loans and investments of reporting member banks decreased $23 million during the week ended May 3. A decline of $59 million in commercial, industrial, and agricultural loans was recorded. Total business loans, at $13,416 million, were $560 million below the comparable sum a year ago.

Excellence in

CHROME-FACED PISTON RINGS

PEDRICK chrome-faced piston rings are best . . . because of these important facts:

HARD, not porous, chrome is used. Hard chrome wears much longer. It does not pick up and hold abrasive material. It has no "imbedability." Its surface has no hills whose peaks can break off and work their way into the crankcase oil.

Pedrick CHROME-faced rings are lapped or run-in at the Pedrick factory.

Pedrick CHROME-faced rings are made of the special C-90 centrifugally cast alloy metal, which has far greater strength and toughness.

Pedrick CHROME-faced rings are "Heat-Shaped" for correct and lasting tension, and complete freedom from shape-distorting stresses and strains in the metal. For longer engine life and greater operating efficiency, specify PEDRICK piston rings! WILKENING MANUFACTURING Co., Philadelphia 42, Pa. *In Canada:* Wilkening Manufacturing Co. (Canada) Ltd., Toronto.

FOR 30 YEARS, SUPPLIER OF PISTON RINGS TO LEADING VEHICLE AND ENGINE MANUFACTURERS

Pedrick "HEAT-SHAPED" PISTON RINGS

Powerglide Production

(*Continued from page* 41)

is an interesting 15-station unit supplied by W. F. & John Barnes—for drilling and tapping all holes in the transmission housing on the right and left sides, and front and rear. This machine too is noteworthy for its unusual compactness, and features an elevator arrangement for the return of pallet fixtures to the loading end.

The arrangement of stations is as follows:

Station	Operation
1	Load and unload.
2	Idle.
3	Idle.
4	RH head—drill one hole. LH head—drill one hole.
5	LH head—combination drill and chamfer six holes. RH head—drill 9/16-in. hole.
6	Idle.
7	LH—idle.
7	RH—comb. counterbore and chamfer one hole. Vertical head—19 holes.
8	LH—idle. RH—combination drill and countersink two holes. Vertical—22 holes.
9	LH—idle. RH—tap two holes. Vertical—idle.
10	Idle.
11	LH—idle. RH—comb. drill and countersink six holes, drill one hole. Vertical—tap 15 holes.
12	LH—idle. RH—drill one hole. Vertical—idle.
13	LH—tap six holes. RH—tap seven holes. Vertical—idle.
14	Idle.

Preceding the transfer machine cycle described above, six holes are drilled, five holes drilled and tapped, and one hole drilled and reamed in one setting in a Barnesdril No. 914, vertical four-station drilling machine.

The third transfer machine is used to drill all angular and horizontal holes on the outside face of the transmission servo cover.

Precision operations on the housing include face grinding and pilot turning. Grinding of the rear face is done on a Blanchard surface grinder, the dimension being held to a total tolerance of 0.005 in. The pilot for engine fit is turned in an Ex-Cell-O, the exceptional feature being that the diameter is held to 14.4970-14.4950 in.

Although both the housing and case are machined to extremely accurate limits, still further precautions are taken to assure axial alignment of the two parts when assembled together. To this end the housing and case are assembled together and made up with five fastenings. The combined assembly now enters a large double end No. 54 Ex-Cell-O precision boring machine where the bores indicated on the sketch are line-bored from each end. Maximum run-out of the various reference surfaces of the combined assembly must be within limits shown on the sketch.

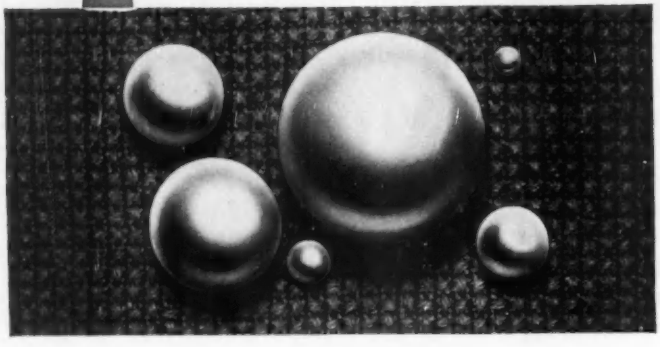
One of the most striking examples of the coordination of engineering, production, and metallurgical activities is found in the conception of the planet carrier and output shaft assembly. Unlike similar elements of other makes of automatic drives, the Chevrolet part is a composite of a pressed steel planet carrier, a flanged output shaft forging, and a stamped parking lock gear which serves as the closure.

The planet carrier is a thick-walled stamping produced in a progressive die set-up at Chevrolet-Flint. An Ex-Cell-O precision boring machine is used for boring and chamfering the hole, and rough-turning the OD of the flange on the opposite end. This is done with cemented-carbide tools. Then follows drilling and countersinking of nine holes in the flange.

Meanwhile the output shaft, received as a forging, is prepared on another machine line. One of the outstanding operations is the turning of the stepped stem end in a three-spindle Bullard Man-Au-Trol machine. It is cycled automatically to turn five different diame-

(*Turn to page* 72, *please*)

IN size and spherical accuracy
perfection of surface
uniformity—dependable physical quality

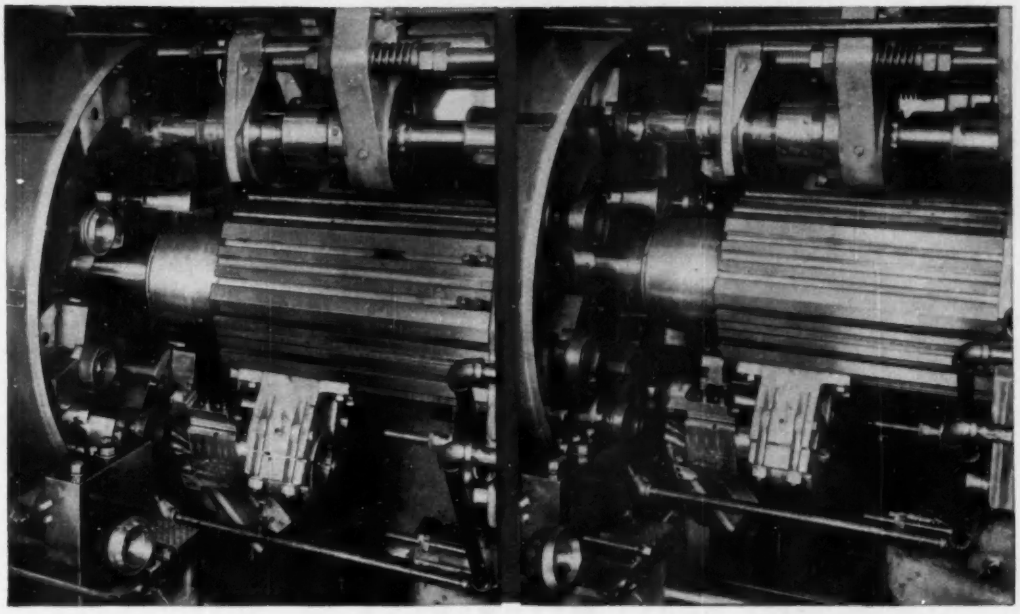


NOT A BETTER BALL MADE . . .

And the service results from every Strom metal ball prove it—not only in the finest precision ball bearings but also in the lot of other ball applications where Strom balls are doing the job better.

Strom has been making precision metal balls for over 25 years for all industry and can be a big help to you in selecting the right ball for any of your requirements. In size and spherical accuracy, perfection of surface, uniformity, and dependable physical quality, there's not a better ball made.

Strom STEEL BALL CO.
1850 So. 54th Ave., Cicero 50, Illinois
Largest Independent and Exclusive Metal Ball Manufacturer



"INCREASED PRODUCTION—500%"

Here's a direct quotation from Catawissa Valve & Fitting Co., Catawissa, Pa.

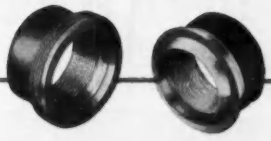
"Your 8" Model RPA-8 spindle Acme-Gridley Chucking Automatic, arranged for double index, has, as nearly as we can estimate, increased production in our plant 500%, on the work to which this machine has been assigned.

"In addition to this increase, we are obtaining a more uniform product than formerly when we moved the work from one machine to another. The operators also report that the ease of operation is considerable over the former method."

Such savings are not unusual for Acme-Gridley users—and here's why:

Sturdy frame construction; wide, open tooling zones, with plenty of room for timesaving power-driven auxiliaries; simple, direct camming—these and many other exclusive Acme-Gridley features all add up to "*More Good Pieces in the Pan at the End of the Day.*"

May we show you how the modern, more versatile Acme-Gridley Automatics can increase production and cut costs in your shop?



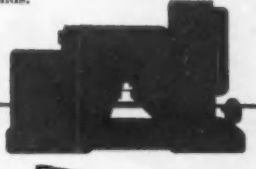
JOB FACTS

PARTS: Forged Steel 2" Pipe Union, head and tail pieces.

MACHINE: Acme-Gridley 8" RPA-8 Chucking Automatics arranged for Double Indexing to finish both ends of a piece in one setup.

OPERATIONS: On head piece, 13—machine time 31.5 seconds.

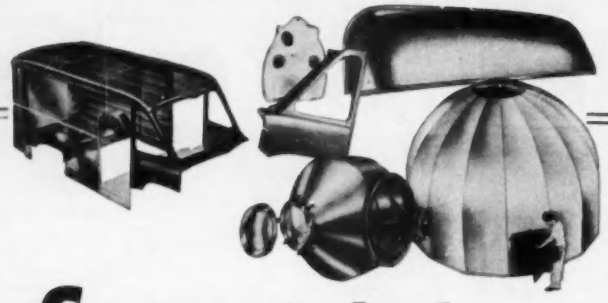
On tail piece, 12 — machine time 31.5 seconds.



The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog-Limit, Motor Starter and Control Station Switches • Solenoids Centrifugs • Contract Manufacturing



Start right! . . .

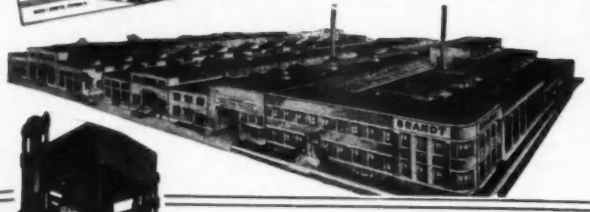
with a bid from BRANDT

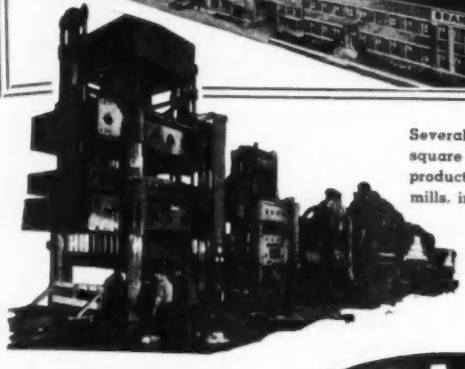
FOR CONTRACT MANUFACTURE OF

Write for file No. 503 of helpful *working* information. Complete facilities.

METAL STAMPINGS
HEAVY WELDMENTS
PRESSED STEEL SHAPES

Extensive Facilities — Wide Range — Exacting Specifications — Rigid Inspection — Precision Workmanship — On-the-Dot Deliveries





Several hundred thousand square feet of streamlined production — near steel mills, in the midst of major rail, water and highway transportation.

CHARLES T. BRANDT, inc.
1700 RIDGELY ST.
BALTIMORE 30, MD.

BRANDT
BALTIMORE

When It's Gotta Fit . . . Brandt Measures Up!

ters as well as the undercut and shoulder at the flange end with single, triangular, solid cemented-carbide tool bits at each station.

Similarly the parking lock gear, a stamped disk of about 15/64-in. nominal thickness ground to width in a double-end Gardner surface grinder, is prepared for this assembly. It contains 61 teeth of 10 DP and pressure angle of 20 deg, cut on Barber-Colman hobbers. Gear teeth are selectively hardened to a controlled profile by induction hardening in a General Electric Electronic unit. An uncommon feature of the operation is that quenching is done with air jets rather than with water.

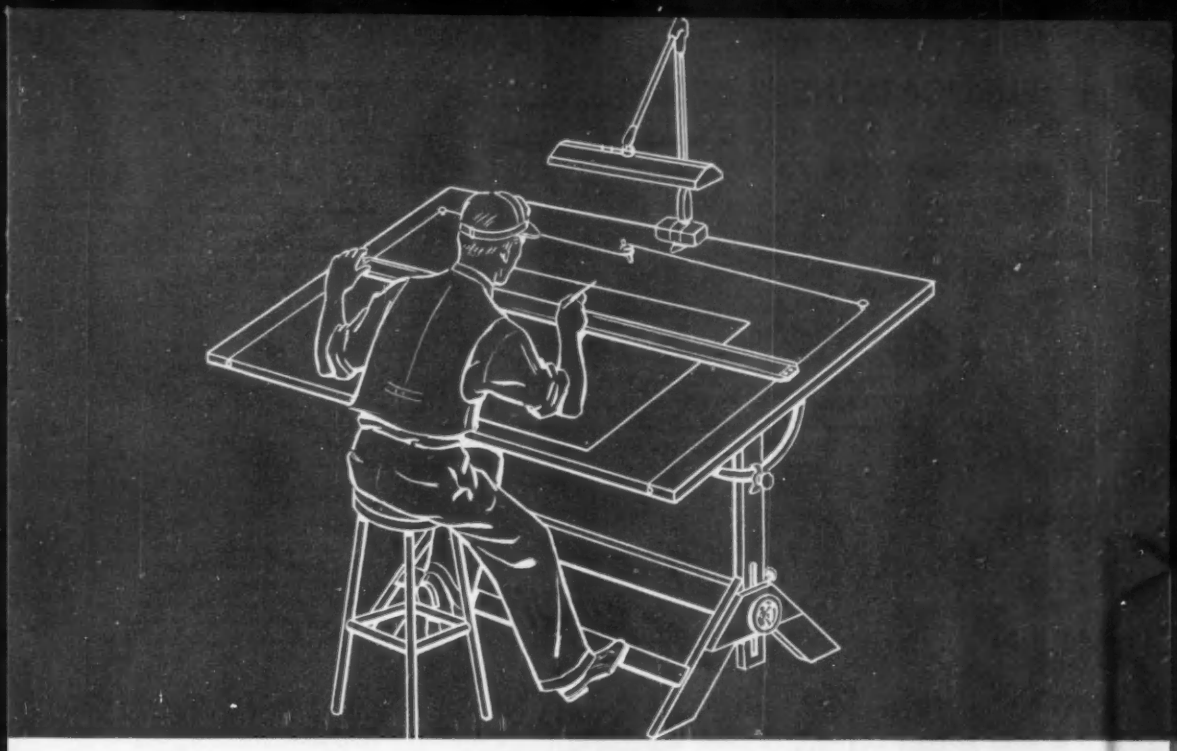
First assembly stage is to rivet together the planet carrier and output shaft. The planet carrier is assembled over the output shaft with the flange end of the shaft inside the shell, then six rivets are inserted from the outside. The rivets are headed in a Tomkins-Johnson Rivitor, the inside head being formed within the counterbore machined in the flange. The sub-assembly is then trued up in a single-end, two-spindle Ex-Cell-O which turns the outer face and face OD of the planet carrier to depth, with respect to the distance from the outside face of the output shaft, and concentrically with the stem diameter. Tnis operation is so fussy that face runout must not exceed 0.005 in. total indicator reading with respect to stem diameters, while stem diameters must be concentric with the turned OD within 0.005 in. total indicator reading.

Final operation on this assembly is the addition of the parking lock gear on the outer face of the planet carrier. This is done by automatic riveting in a Tomkins-Johnson Model R Rivitor equipped with hopper feed. Immediately following riveting the assembly is placed in a special Cincinnati chucking grinder for grinding the OD of the gear to a total tolerance of 0.002 in., and concentric with stem diameter within 0.005 in. total indicator reading.

Fussiest detail on this assembly is the preparation of bores for the planet pinion shafts, which run through the parking lock gear and the output shaft flange end. They are drilled, chamfered, and line-reamed in a special double-end, four-station, trunnion type Snyder drilling machine with automatic index. This is followed by semi-finish and finish-boring of the same holes in a single-end Ex-Cell-O precision-boring machine.

Some idea of the nature of the alignment specified for the bores may be judged from the fact that the center lines of the holes must be parallel with the axis of the ground stem end diameters within 0.002 in. in a 10-in. gage length, actually to a tolerance of 0.00025 in.

Final operation is to press a small bushing into the shaft bore within the assembly, then precision-bore it in a Heald Bore-Matic to maintain concentricity with stem end diameters within 0.003 in. total indicator reading.



This Automotive Engineer Is Definitely Making It Tough for Universal Joint Builders—*and we're glad of it!*

The automotive engineer works constantly to increase the power and step up the speed of cars and trucks. As these efforts succeed, the burden placed upon universal joints becomes ever greater. They must transmit more torque, withstand extreme stresses, high pressures, and shock loads.

We at Universal Products are keeping pace with these demands. We are building "DETROIT" Universal Joints to meet the exacting standards of automotive engineers. No requirements of torque, speeds or stresses, no limitations of space restrict the dependability of "DETROIT" Universal Joints. They represent the utmost in precision machining, high grade alloy steels, effective heat treating, and rigid inspections. They are built to absorb greater loads and assure longer life.

Yes—the automotive engineer is making it tough for us. *We're glad of it!* It's progress.

Detroit UNIVERSAL JOINTS

DETROIT UNIVERSAL JOINTS

UNIVERSAL PRODUCTS CO., INC., Dearborn, Mich.

PUBLICATIONS

(*Continued from page* 62)

H-140 Air-Operated Valves

The Bellows Co. — A new bulletin, No. AU250, describes in detail, using wiring diagrams and dimensional drawings, the company's solenoid air-operated valve, named the Electroaire Valve.

H-141 "dag" Colloidal Graphite

Acheson Colloids Corp. — A new bulletin, No. 425, covers the use of "dag" colloidal graphite dispersions in foundries. The 2-color bulletin contains many foundry pictures.

H-142 Injection Molding Equipment

The Fellows Gear Shaper Co.—"Speed Flo," a new circular, covers high-speed injection molding machines of new design, the 1B 3-15, and the 5C-8 for high capacity plastics molding. Performance data and design features are included in the circular.

H-143 Die Cushions

Clearing Machine Corp. — A new catalog covers cushions for all makes of presses. Helpful data for use in pianning installations and the operation of cushions in general will be found in the catalog.

H-144 Control Units

Wheelco Instruments Co. — A new bulletin, CAB-1, contains descriptions of the Cabinet Series, illustrated suggestions for combining auxiliary control devices, specifications and prices.

H-145 Rivets

Chicago Rivet & Machine Co. — A new industrial catalog on rivets is available. It contains essential engineering information and a complete list of many types of rivets, as well as machines used in the various types of assemblies.

H-146 Taps

Pratt & Whitney Div., Niles-Bement-Pond Co.—"Tap Life" is the title of an attractive 2-color booklet describing and illustrating the company's line of taps. The booklet contains informative, factual information concerning a variety of outstanding tapping operations.

SHOW A NEAT FIGURE

IN SAVINGS ON

SOLVENT CONSUMPTION

BLAKESLEE SOLVENT VAPOR DEGREASERS

Blakeslee Solvent Vapor Degreasers are engineered to give 100% oil-free jobs with *lowest solvent consumption*. YES, through patented construction and operational features, they actually USE LESS SOLVENT.

They're time-saving too. Metal parts are rendered chemically clean and dry in a few seconds, eliminating tie-ups and rejects in subsequent finishing operations.

Get the benefits of Blakeslee experience and superior performance in the Solvent Vapor Degreaser—engineered for you.

You add less solvent daily to Blakeslee Degreasers

G. S. BLAKESLEE & CO.

BLACOSOLV DEGREASERS AND SOLVENT

NIAGARA METAL PARTS WASHERS

G. S. BLAKESLEE CO., CHICAGO 50, ILLINOIS
NEW YORK, N. Y. TORONTO, ONT.

MEN *in the* NEWS

(*Continued from page* 25)

been announced. He succeeds the late **Harry Merrick.**

Gedney Electric Co. — **Herbert H. Benfield** has become associated with the company as Vice-President in charge of Sales.

The Ansco Co.—**Edward D. Williams**, formerly Sales Manager of the X-Ray Products Div., has been appointed Sales Manager.

Lempco Products, Inc.—**M. W. Kreeger** has been made Vice-President and General Manager of Lempco Automotive, a subsidiary. **C. D. Burdette** is the new Advertising Manager of the company.

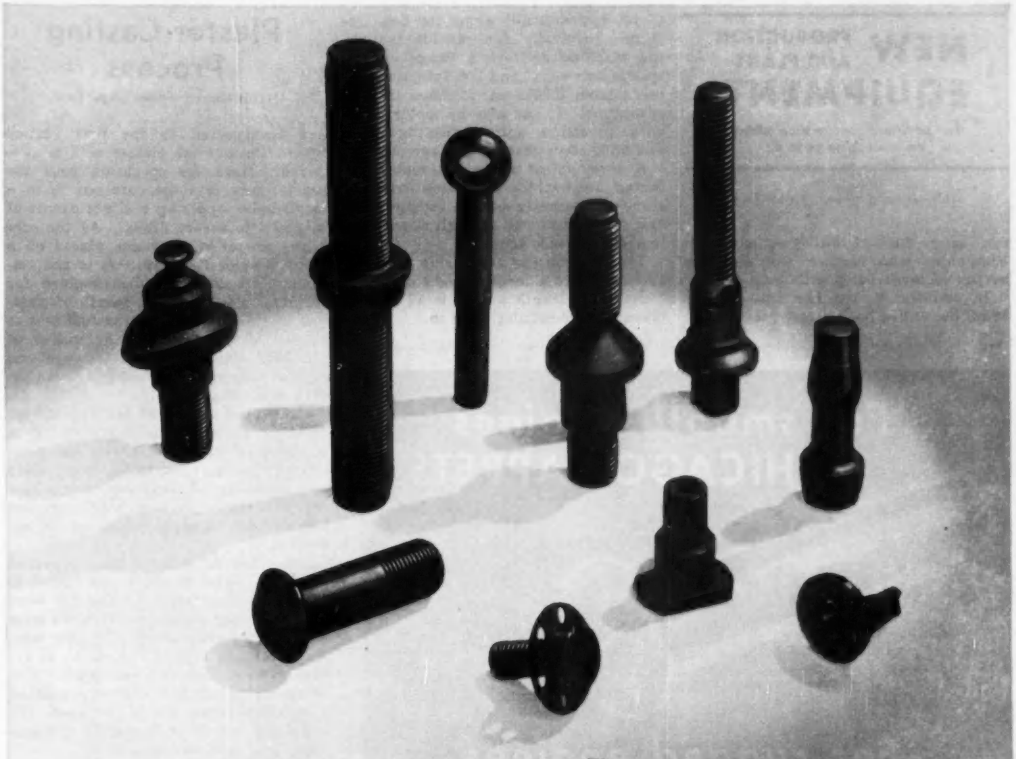
The Sherwin-Williams Co. — Announcement of the appointment of **Donald S. Gaarder** as Asst. General Manager and **Lee Cotten** as Co-ordinator of Technical Operations of the Industrial Finishes Div., has been made.

American Engineering Co.—The appointment of **John C. Mevius** to the post of Sales Manager of the Hydraulic Div. has been announced. Mr. Mevius was formerly Sales Manager of the Materials Handling Div.

York Electric & Machine Co.—**J. A. Tompkins, Jr.**, has been appointed General Sales Manager.

Allis-Chalmers Mfg. Co.—**Floyd J. Mischke** has been appointed Export Manager. He succeeds the late **M. J. Proud.**

Kent-Owens Machine Co.—The election of **E. W. Donkel** as President, to fill the post vacated by the death of his father, has been announced.



Consider *Your* Savings In COLD FORGED PARTS

Do you use many parts, ordinarily produced by more expensive methods, which can be cold forged? While there are some limitations in cold forging, it is true that, in many cases, Allied has manufactured parts never before considered for this type of production.

Through engineering and production methods which Allied employs, special cold forged parts can be produced in many unusual shapes and sizes. Tolerances as close as are required for most machined parts are secured. The cold forging process invariably provides greater strength and durability in the parts produced. Of most importance, in high volume production, your part costs can be reduced materially.

Don't pass up the possibility of your parts being produced more economically. Send your part prints to learn what Allied can do for you.

PRECISION • EXPERIENCE • DEPENDABILITY

ALLIED CORPORATION PRODUCTS

ALLIED PRODUCTS CORPORATION

DEPARTMENT 52

12607 BURT ROAD • DETROIT 23, MICHIGAN

HARDENED AND PRECISION GROUND PARTS • STANDARD CAP SCREWS • SPECIAL COLD FORGED PARTS
SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST • JIGS • FIXTURES • STEAM-HEATED PLASTIC MOLDS • SPECIAL PRODUCTION TOOLS • R-B INTERCHANGEABLE PUNCHES AND DIES • DIE MAKERS' SUPPLIES

NEW PRODUCTION AND PLANT EQUIPMENT

For additional information please use coupon on page 62

(*Continued from page* 54)

ers, large turbine builders, and any companies who require the accurate boring of large holes with long depths.

In addition to the bar feed in the head, the entire boring and facing unit moves hydraulically along the bed. Designed primarily for carbide tooling, the machine delivers a range of bar speeds between 3 and 150 rpm, and bar feeds from 0.0005 in. to 0.500 in. per revolution. It has a 40 hp motor drive with precision anti-friction bearings and alloy steel gearing throughout.

A development is the continuous feed facing head which dispenses with the star-feed formerly used on facing heads and allows full use of high speed facing with carbide tools.

The basic boring and facing unit can be adapted to a large variety of work.

Standard length of bar is 17 ft and travel in one setting is 60 in.

Plaster Casting Process

(*Continued from page* 51)

are transported to the first station where the special plaster mix is prepared. Here the operators pour the plaster mix into the core box from a small ladle, applying a slight excess of material to assure filling. As the core boxes are filled, they are placed on a belt conveyor for transport to the station where they are disassembled for removal of cores. The length of passage on this conveyor line is sufficient to permit cores to solidify by means of chemical action, at room temperature, so that they can be handled without injury prior to drying.

Illustrated is one of the typical operations showing the assembly of a combination dry sand chassis and plaster core parts, constituting a complete core assembly. It indicates clearly how the accurately formed cores are integrated by hand to make up an assembly.

After the cores have been prepared they are placed on trays and routed to the core drying ovens. Alcoa has been experimenting constantly with the most economical combinations of drying temperatures and drying time so as to reduce process time to a minimum. The best combination at the present writing is a temperature range between 175 and 212 F, resulting in a cycle of something less than two hours.

Meanwhile, the copes and drags for the molds are prepared on several molding lines, using familiar semi-automatic molding machines for the purpose. The core assemblies are fitted in conventional manner and the cope and drag locked together ready for pouring. Considerable development work was involved in the design of the gate and riser arrangement for each of the parts described. Some impression of their character may be gained from the illustration reproduced here.

It may be noted that the larger rotating elements—the pump and turbine—are molded one to a flask while the two smaller elements are molded two to a flask.

The flasks, as prepared, are transported by conveyor to the pouring station where the aluminum alloy is melted and held at proper temperature. Pouring is done with hand ladles at an average temperature of 1400 F.

After pouring, the molds are permitted to cool while traveling on the cooling conveyor, and finally reach the knock-out station where the sand and core material are removed. The gate and riser assembly is removed by sawing; then the castings are cleaned and rough-ground in readiness for shipment to Packard.

The final step in the process is the aging of castings prior to shipment. This is a stabilizing treatment in which the parts are held in an oven at 400 F for eight hours.

Mechanical Tappets
Hydraulic Tappets
Oil Pump to Distributor Shafts
Rocker Arm Shafts
Water Pump Shafts
Flywheel to Crankshaft Screws
Adjusting Screws
Cylinder Head Cap Screws
Main Bearing Cap Screws
Differential Carrier Screws
Cylinder Head Studs
Main Bearing Studs
Wheel Bolts and Studs
Push Rods
Retainers
Connecting Rod Bolts
Automatic Transmission Valves
Hydraulic Cylinder Pistons
Diesel Energy Cells
Remote Control Levers

Special Screw Machine Parts 1/16" to 5" Diameter, Plain or hardened and ground ● Cap Screws ● Set Screws ● Nuts ● Studs ● Taper Pins ● Socket Screw Products ●

The CHICAGO SCREW COMPANY
2701 WASHINGTON BLVD.
BELLWOOD, ILL.
Established 1872

first

in the field...

HARRISON OIL COOLERS for Automatic Transmissions

Harrison has kept pace with the automotive industry by developing effective oil coolers for the new transmissions. It has built more of these cooling units than any other manufacturer in the field.

For each application, Harrison designs an oil cooler exactly fitted to its task—just right for the rate of flow, pressure, and temperature range. Then Harrison's manufacturing know-how produces coolers that are compact, light and dependable.

If you have a transmission oil cooling problem, consult Harrison. Facilities include complete engineering laboratories for testing designs under accurately controlled conditions. Harrison Radiator Division, General Motors Corporation, Lockport, N. Y.

HARRISON

RADIATORS, THERMOSTATS, HEATERS, DEFROSTERS, OIL COOLERS

IHC New Transfer Machines

(*Continued from page* 36)

unit tap two 7/16 in. bell housing securing holes and tap oil gallery hole in back end of case with a ⅜ in. pipe tap. Eleven spindles on right hand horizontal tapping unit tap eleven ⅜ in. securing holes in front end of block.

Station 14—Unload.

Sundstrand Transfer Machine

Station 1—Load cylinder head.

Station 2—A vertical spindle and a horizontal spindle on one unit finish mill the valve cover surface and spark plug side.

Station 3 — Head is automatically turned 180 deg.

Station 4—One spindle on a vertical unit rough mills combustion face.

Station 5—One spindle on horizontal unit finish mills manifold side.

Station 6—Unload.

Natco Transfer Machine

Station 1—Load cylinder head.

Station 2 — Sixteen spindles on left hand horizontal unit drill 13 capscrew mounting holes ½ way through, and drill 3 cover mounting holes.

Station 3—Idle.

Station 4—Seventeen spindles on left hand unit drill 12 valve guide holes, 2 water outlet mounting holes, and counterbore 3 bracket mounting holes. Right hand unit drills 15 capscrew mounting holes through.

Station 5—Idle.

Station 6 — Fifteen spindles on left hand unit counterbore 12 valve spring seats, and finish ream 3 bracket mounting holes. Fourteen spindles on right hand unit drill 8 water circulating holes, rough core drill and counterbore 3 exhaust valve holes, and rough core drill 3 intake valve holes.

Station 7—Idle.

Station 8 — Twenty-two spindles on left hand unit chamfer 3 bracket mounting holes and 2 water outlet mounting holes, drill 12 push rod holes half depth, drill 2 pipe plug holes, and chamfer 3 cover mounting holes. Seven spindles on right hand unit rough core drill and counterbore 3 exhaust valve holes, rough core drill 3 intake valve holes, and end mill one oil feed hole.

Station 9—Idle.

Station 10 — Seven spindles on left hand unit tap 2 water outlet mounting holes, tap 2 pipe tap holes and 3 cover mounting holes. Thirteen spindles on right hand unit drill 12 push rod holes through, and drill 1 water circulating hole.

Station 11—Unload.

When this modern transfer equipment was still in the planning stage, much thought was given toward holding tool down-time to a minimum. All transfer machines have conveniently located tool racks which are kept filled with present tools. Milling machine stations were designed with quick removable rails and set pads were placed in easy-to-reach locations. These features enable the production departments to make a complete change of cutting tools in less than 45 minutes on many of the larger transfer machines.

Inspection and Quality Control departments played an important part in selecting the most modern and accurate gaging equipment available. These factors are enabling the production departments to hold better finishes and closer tolerances which are approximately 50 per cent of the allowable print specifications.

Manufacturers of...

HARDENED and GROUND PARTS

for over 40 years

KING PIN

SINCE the day of the duster and goggles, The Brown Corp. has meant highest quality precision parts for the automotive industry. Today, Brown Parts serve trucks, tractors, trailers, buses, axle builders, off-the-road machines and Diesel locomotives. The production methods and facilities we have developed are unexcelled — uniform product quality is assured—deliveries are reliable—service is efficient. Ask any of our long list of satisfied customers throughout the industry.

For further information about our specialized production of hardened and ground automotive and industrial parts, just drop us a note. We invite an opportunity to quote on your work.

Henry W. Brown

PRESIDENT

Parts include . . .
King Pins
Shackle Bolts
Shackle Pins
Brake Anchor Bolts
Countershafts
Idler Shafts
Stub Axle Shafts
Steering Ball Bolts
Beam Balls and Bolts
5th-Wheel Rocker Shafts
Wheel Studs
Water Pump Shafts
. . . anything in the hardened and ground line, of any analysis steel, up to 4¼" diameter.

THE BROWN CORP.

213 BELLEVUE AVE. SYRACUSE, N. Y.

C. H. Ehlert, 3407 Clarendon Rd., Cleveland • N. F. Spring, 4716 Balfour Rd., Detroit • R. C. Sanderson, 5252 Broadway, Chicago • Harry J. Windmiller, 1704 Carlton, Fort Worth • Elmer L. Kingsland, 6888 Beechley Ave., Long Beach, Calif. • J. B. Hunt, E. L. Kingsland Co., 5811 S. E. Yamhill St., Portland, Ore.

So Much depends on the Clutch

ENGINEERING B-W PRODUCTION

Morning rush hour . . . evening exodus . . . weekend traffic jam . . . that's when motorists really appreciate smooth, fast pickup in their cars.

But smooth, fast pickup doesn't just happen. In many of today's leading makes of cars, it's the result of the quick engagement of a *Borglite* Clutch Plate, engineered and produced by Borg-Warner's Borg & Beck Division.

Soft as a kitten's step—
Strong as a bulldog's grip

The unique design and precision construction of a B-W *Borglite* Clutch Plate, with its patented two-stage very soft initial and firm final cushion, assure faster, quieter gear shifting, easier clutch action, and smoother engagement of the engine.

All of which means easier driving and far less road fatigue.

This is just one more example of how Borg-Warner's "design it better—make it better" policy serves the automotive industry, and America, every day.

BW *Engineering makes it work*

BW *Production makes it available*

Almost every American benefits every day from the 185 products made by

BORG-WARNER

ENGINEERING B-W PRODUCTION

THESE UNITS FORM BORG-WARNER, *Executive Offices, Chicago:* BORG & BECK • BORG-WARNER INTERNATIONAL • BORG-WARNER SERVICE PARTS • CALUMET STEEL • DETROIT GEAR • DETROIT VAPOR STOVE • FRANKLIN STEEL • INGERSOLL STEEL • LONG MANUFACTURING • LONG MANUFACTURING CO. LTD. MARBON • MARVEL-SCHEBLER CARBURETER • MECHANICS UNIVERSAL JOINT • MORSE CHAIN MORSE CHAIN CO. LTD. • NORGE • NORGE HEAT • PESCO PRODUCTS • ROCKFORD CLUTCH SPRING DIVISION • WARNER AUTOMOTIVE PARTS • WARNER GEAR • WARNER GEAR CO. LTD.

WITTEK

NOC-OUT HOSE CLAMPS

The Standard of the Automotive Industry

Type A—Radiator Hose Connections

Type G-BB—Booster Brake Hose Connections No. G-B-HH for Hot Water Heater Hose

Type HP—High Pressure Hose Connections

Wittek Noc-Out Hose Clamps are designed in a variety of types made in many sizes for use by the automotive industry. Because they provide the most practical leakproof hose connection, they are specified by the leading manufacturers as standard, original equipment for automobiles, buses, trucks and tractors.

Write for descriptive literature.

Automotive HOSE CLAMPS

WITTEK MANUFACTURING CO.

4319 W. 24th Place, Chicago 23, Ill.

Dependability in Hose Clamps for Over a Quarter of a Century

Wedge Type Belts

(*Continued from page 32*)

of the system is reduced, the coefficient of friction or arc of contact must be increased or slippage results.

Inversely as the coefficient of friction is decreased the tension must be increased if the drive is to continue to operate.

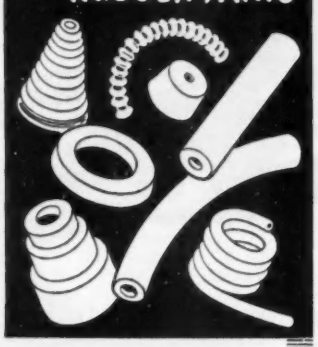
Tests show the life of belts varies inversely as the fourth power of the tension, the fifth power of pulley diameter and the 0.5 power of speed. From this it can be deduced that it is highly desirable to keep the diameter of the pulleys as large as possible if the drive is to give long life. It is likewise important to keep the drive tensioned properly if satisfactory performance is to be maintained. In automotive drives the pulley diameter and coefficient of friction are fixed with the design of the drive whereas the tension and speed are variable. Inasmuch as speed has little effect on the life of the system, it can be practically disregarded. Tension, however, is exactly opposite. Being a fourth power factor every effort possible should be taken to keep this factor under control if long life is expected. Tension is usually maintained in the present automotive system by the "guess and try" method. However, on truck operation, where long life is a definite requirement and belts represent an appreciable amount in the cost of operation, some attempts have been made to control the tension in the system.

Since the power required by the fan and waterpump increase as the cube of the speed and the requirements of the compressor and generator are variable but in general increase with higher speed, the usual practice is to put sufficient tension in the belt initially to prevent slippage of the belt when maximum horsepower is developed. This means that when the belt system is operating at any speed under top speed the belt is considerably over tensioned. The optimum is a device which will cost nothing and change the tension in the belt as required by the horsepower output of the accessories. This device would eliminate any thought or training on the part of maintenance men for optimum performance of the drive.

In order to give satisfactory performance of the belt drive in general, pulley design as well as belt design must be considered. Hence, it became not only a problem of belt design but of economical pulley design. In order to compete in the automotive field, it became necessary to develop a pulley which could be made in production as cheap or cheaper than the present pulley which accommodates the typical trapezoidal type belt. Several designs

(*Turn to page 82, please*)

SILICONE RUBBER PARTS



WITHSTAND EXTREME TEMPERATURES RANGING FROM −160° to +500° F.

SILICONE RUBBER PARTS play important roles in automotive, aviation, electrical, refrigeration, and original equipment manufacturing industries because they retain desirable rubber-like properties at temperatures from −160° to +500°.

SILICONE RUBBER PARTS resist permanent compression, have excellent dielectric properties, and withstand hot lubricating oils, Freon, liquid ammonia, sulphur dioxide, ozone, tricresyl phosphate, and chlorinated hydrocarbons.

SILICONE RUBBER PARTS can replace metal constructions forced upon design engineers by limited thermal stability of organic rubbers. Gaskets, diaphragms, grommets, washers, sleeves, channel, packing, tubing, and numerous other molded, extruded, punched, and lathe-cut products can be fabricated from Silicone stocks.

Write today for complete information or quotations.

STALWART RUBBER COMPANY

Specify Stalwart for Quality Custom Rubber Products

6222 Northfield Road

BEDFORD, OHIO

Metal men have many reasons for using HOUGHTO-DRAW 357...

...this man likes the bright finish it provides

...this man likes the way it steps up production

...this man likes the cleaner tanks and lines (as compared to lime)

...this man likes its low cost per ton of steel drawn

...this man likes its ability to handle so many different jobs

Houghto-Draw 357 was developed as a superior drawing lubricant for bars and rods. It is in paste form, and contains waxes, fats and colloidal pigment, with an extreme-pressure additive.

It is recommended for cold drawing of hot or cold rolled bars or rods, particularly as a replacement for lime, being cleaner and providing a brighter finish. It's being used for cold-heading too, and for tube drawing.

Solutions come up to heat quicker because heating coils stay clean. No re-dip is necessary, as the coating is adhesive.

This drawing aid has been used in production for over a year without dumping the tank. For sheet drawing and stamping there are other Houghto-Draws that will step up production. May we demonstrate?

E. F. HOUGHTON & CO.
303 W. Lehigh Ave., Phila. 33
Fisher Bldg., Detroit

Houghton products for the metal-working industry include:

HEAT TREATING SALTS ... QUENCHING OILS ... CLEANERS ...
CUTTING OILS ... RUST PREVENTIVES ... INHIBITORS ...
"FORTIFIED" LUBRICANTS ... PACKINGS AND LEATHER BELTING

were tried but many proved to be out-of-line in price. Shown in Fig. 6 are typical examples of stamped spot welded, stamped hydrogen brazed, spun steel and cast pulleys, all of which are satisfactory for use with the belt. The main purpose of the drop center design in the pulley is to allow the belt to protrude through the opening thus assuring continuous maintainance of coefficient of friction and satisfactory performance of the belt drive.

In general, spot welded pulleys have been found to be satisfactory if the welds are not subjected to flexing. If the spots are sufficiently removed from the points of flexing, satisfactory performance will be obtained. In the stamped type, it is desirable to hold the pulley together as close as possible to the point where the metal meets in the bottom of the vee so as to prevent deflection of the sides of the pulley. This can be very satisfactorily accomplished by hydrogen brazing the parts together or by curving the metal at this point to increase its stiffness factor or a combination of both. Examples of this type can be seen in Fig. 4.

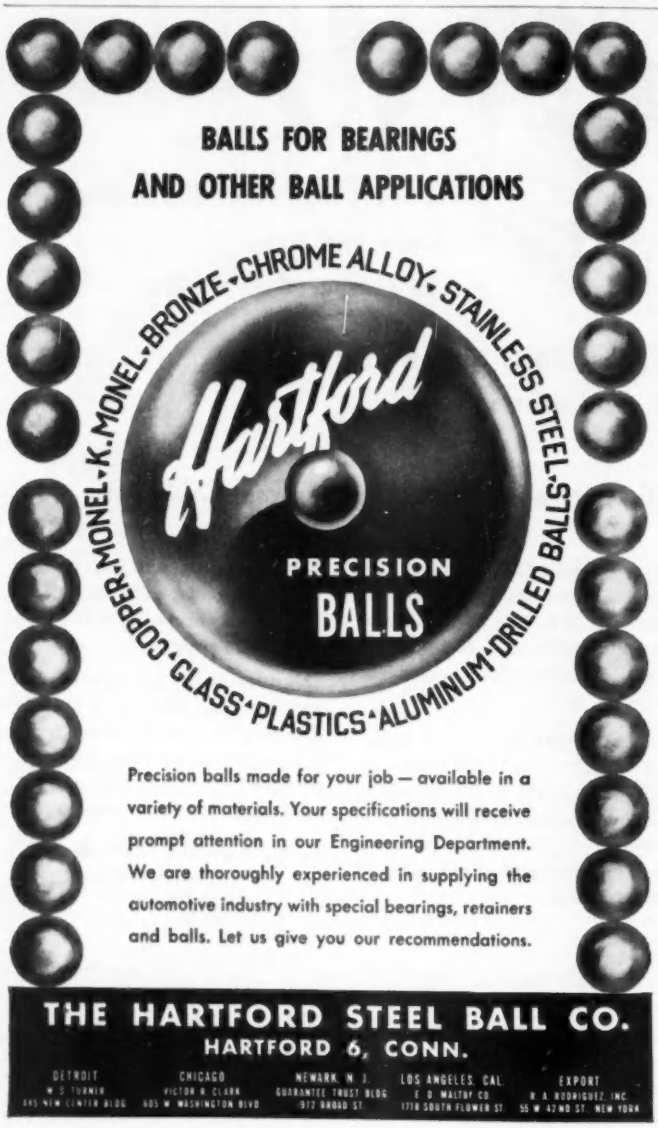
Up to the present time price usually ruled out the cast pulley from the automobile industry except in cases where an extra large amount of machine work was required on the pulley. In the last year, however, prices of castings have been reduced considerably and because of this, there has been some tendency to increase the use of the cast design. There is definitely a place in the truck and bus field for the use of this type of pulley as the production volume is low and multiple belts are often required. Because of close tolerances required, multiple pulley grooves must be made in the form of machined castings. It has been generally conceded by the manufacturers of stamped and spun pulleys that it is almost impossible to hold the tolerances in these pulleys as close as required.

In order to prevent field failures of pulleys, some of the pulley manufacturers, as well as the automotive companies, have set up two pulley tests whereby the pulleys may be operated about 3000 rpm with approximately 150 to 200 lb tension. Because of the excessive tension, steel cable belts are used for the test. Under these conditions a pulley running 100 hours is evidence of satisfactory cross section of metal in the pulleys. Pulleys which have reduced thickness of metal due to forming operations in manufacture usually fail in ½ to 10 hours depending upon the amount of reduction in the metal gage.

Pulleys which are made by spinning metal into the desired groove shape have a hard surface which tends to resist wear better than those which are stamped. Pulleys which are stamped, hydrogen-brazed and then reformed by rollers not only have a hard surface but in general have less "run-out" than other types—although all are considered satisfactory for use in automotive accessories drives. Different shaped pulleys lend themselves to different types of manufacture.

Shortly after starting production on this type of belt an attempt was made to set industry standards whereby the cross section of the pulley and belt would be the same regardless of who manufactured the drive. In the past it had been more or less the practice to design the cross section of the belt from previous experience on that particular drive or a similar drive. SAE standards now show five standard cross sections of trapezoidal belts but there was no economical incentive to change from the belt in use to the standard. Tools for pulleys and molds for belts as a rule had been in production for some period of time and adoption of the standards offered no price, weight or space saving. In general, the SAE standards were not adopted unless a radical change was necessary in the accessory drive. A check on the V-belts used by the automotive industry for passenger cars shows that the top width of belts varied from 0.706 in. to 1.08 in., angle of belt, from 32 deg to 44 deg, thickness of belt, from 0.40 in. to 0.531 in., and outside length from 37½ in. to 52½ in. with the majority of lengths in the range of 47 in. to 49 in.

(*Turn to page 84, please*)


BALLS FOR BEARINGS
AND OTHER BALL APPLICATIONS
COPPER • MONEL • K-MONEL • BRONZE • CHROME ALLOY • STAINLESS STEEL • STEEL BALLS • DRILLED • ALUMINUM • PLASTICS • GLASS
Hartford
PRECISION
BALLS
Precision balls made for your job — available in a variety of materials. Your specifications will receive prompt attention in our Engineering Department. We are thoroughly experienced in supplying the automotive industry with special bearings, retainers and balls. Let us give you our recommendations.
THE HARTFORD STEEL BALL CO.
HARTFORD 6, CONN.
DETROIT
W. S. TURNER
645 NEW CENTER BLDG.
CHICAGO
VICTOR R. CLARK
605 W. WASHINGTON BLVD.
NEWARK, N. J.
GUARANTEE TRUST BLDG.
972 BROAD ST.
LOS ANGELES, CAL.
E. D. MALTBY CO.
1718 SOUTH FLOWER ST.
EXPORT
R. A. RODRIGUEZ, INC.
55 W. 42ND ST., NEW YORK

Silicone News
DC
SILICONES
Dow Corning Silicone Insulation Saves Over $8,000 a Year on 4 Motors!
In the Saginaw Plant of Eaton Manufacturing Co., the output of four of these machines is stepped-up by stopping the 5 h. p., 3600 r.p.m. motors with a jolt of direct current as soon as 5 operations are performed on a small automotive part. With 105 starts and stops per hour, Class A insulated motors had an average life of only 8 days—32 failures for each of the 4 motors or a potential $10,000 a year in rewind costs alone.
Rewound with Dow Corning Silicone (Class H) Insulation, these motors now have a minimum life of 6 months; save Eaton a potential $8,000 a year plus a few hundred man hours of labor and some 40,000 parts that would have been lost due to down time.
DOWN TIME AND LOST PRODUCTION DUE TO MOTOR FAILURE ARE NO LONGER NECESSARY! Prove it in your own plant by having your hardest working motors rewound with Dow Corning Silicone Insulation. Call our nearest branch office for technical assistance or write to Dept. C-16.
Dow Corning Silicones Mean Business
DOW CORNING CORPORATION
MIDLAND, MICHIGAN
Atlanta • Chicago • Cleveland • Dallas
Los Angeles • New York
In Canada: Fiberglas Canada Ltd., Toronto
In Great Britain: Alfright and Wilson, Ltd., London
FIRST in Silicones
Dow Corning

Among engineering materials the performance of *Dow Corning Silicones* sounds as fabulous as the tall tales told of Paul Bunyan or Mike Fink who claimed to be half-man, half-alligator . . .

The tall tales of the old frontier are reflected in skyscrapers . . . jet planes that disappear before you hear them . . . materials that are half inorganic, half organic. Fact has become more fabulous than folk tales. Here are a few of the fabulous facts about Dow Corning Silicones:

- DC Silicone (Class H) Insulation has at least 10 times the life of the best electrical insulating materials previously available. It also increases the power per pound ratio of electrical equipment by 100%.
- DC 44 Silicone Grease has at least 10 times the life of organic greases.
- Silastic*, the Dow Corning Silicone rubber, is serviceable at temperatures from −100 to +500° F.—an impossible assignment for any other kind of rubber.

The consumer is shopping for quality at a price. Management demands longer life, increased production and lower maintenance costs.

YOU NEED DOW CORNING SILICONES TO MAKE THE "IMPOSSIBLE" PRACTICAL

Write today for technical data on

DC SILICONE GREASES

Including relative bleed, evaporation and oxidation resistance of Silicone and organic greases, penetrometer, solidification and flash points; performance and application data.

DC SILICONE (CLASS H) INSULATION

Including results of accelerated life testing of Silicone (Class H) and Class B insulated motors; service life data on rewound equipment; and data on performance of equipment designed to capitalize on exceptional heat and moisture resistance.

*T. M. Reg. U. S. Pat. Off.

DOW CORNING CORPORATION, MIDLAND, MICHIGAN

Please send me ☐ Grease data sheet No. C-17.
☐ Silicone Insulation data sheet No. C-17A.

Name_____

Title_____

Company_____

City_____ Zone____ State_____

DOW CORNING CORPORATION, MIDLAND, MICHIGAN

Atlanta • Dallas • Chicago • Cleveland • Los Angeles • New York
In Canada: Fiberglas Canada Ltd., Toronto • In Great Britain: Alfright and Wilson, Ltd., London

The shape's the thing...

The selection of a suitable steel and its subsequent satisfactory performance can be made easy by good design.

How and in what shape a part is made is, we hold, of fundamentally greater importance than of what it is made.

In designing a piece of machinery it is necessary to consider Design, the choice of steel, and its Heat Treatment. All three are highly significant factors, but of them we believe Design to be vital because even the best in steel and treatment will not save a poorly designed part.

To evaluate the importance of good design and its vital relationship to the selection of steel and its heat treatment, we have prepared a book—"Three Keys to Satisfaction". This starts by discussing mainly design factors involved in stress concentrations, and includes useful sketches comparing poor and good features of design from the aspect of subsequent metallurgy. It is available on request to all engineers and designers.

Climax Molybdenum Company

500 Fifth Avenue
New York City

Please send your
FREE BOOKLET
3 KEYS TO SATISFACTION

Name.....
Position.....
Company.....
Address.....

MOLY

A1-6

In order to avoid a repetition of slight variations in the dimensions of cross sections of belts, it was believed that if standards could be adopted at this time it would be beneficial to all concerned. From a rubber industry standpoint it would eliminate a multiplicity of molds. From an automotive standpoint it would greatly simplify the service problem; and for the pulley manufacturer, it would reduce the number of forming tools required. In addition to one standard cross section, it was suggested earlier in the meetings which took place that length increments of one in. be established with the thought in mind that if new drive systems were being designed, it would be possible in many cases to design the pulley diameters so that the belt length would fall on the inch. This would mean that in the event of fan belt failure on the road, it would only be a matter of asking for a 47 in. or 48 in. fan belt or whatever size happened to fit that particular car. With such a standard the number of belts required in a gas station's stock would dwindle considerably.

The matter of standards was taken up by the V-belt section of the SAE-ASTM Technical Committee on Automotive Rubber. Before standards were ultimately approved there were concessions and compromises as to practical methods of design and manufacture. At the time of final meetings the companies represented had collected much data and test information, all of which contributed to the general information on the new type belt. Pulley manufacturers were consulted as to the practical limitations in design and tolerances.

The result of many meetings concluded in the adoption of the single groove dimensions as shown in Fig. 5. Each company manufacturing V-belts would manufacture a belt which it considered the proper dimensions to fit this groove. In the case of Goodyear, the angle of the belt is 40 deg as shown in Fig. 5. Other companies manufacturing V-belts have adopted belt angles very close to 40 deg depending somewhat on their method of manufacture. The overall dimensions of the cross section of the belt vary somewhat from company to company but all are interchangeable with the standard groove as adopted. Because of simplification of manufacture there is a tendency to reduce the thickness of the belt slightly thereby making some of the present belts in the market thinner than the original ones. This trend does not exist in belts using steel cable and in this case full depth belts are used. It has been found very practical to use the rayon belt for standard accessory drives and steel cable belts on cars using large generators such as police cars. In both designs of belts the standard pulleys are used which makes the conversion a matter of only changing belts.

The proposed standards were for-

(*Turn to page 86, please*)

The genial, friendly host in the **HEART** *of Cleveland*

Hotel Cleveland

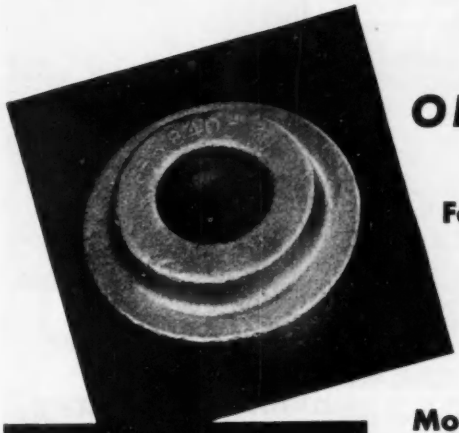
Whether you come by train, plane or motor . . . for business or pleasure . . . you'll like the convenience of comfortable, friendly Hotel Cleveland. Only a few steps by covered passage from Union Terminal trains and garage. Close to theatres, sporting events, stores, office buildings. Quiet, sleep-inviting rooms . . . spirited, colorful new decorations . . . attentive service and sincerely warm hospitality will greet you.

All rooms with radio . . . many with television. Singles from $4.50, doubles from $6

HOTEL CLEVELAND
Cleveland, Ohio

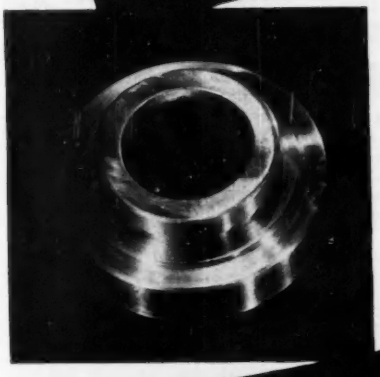
Get Fewer Rejects

AT EVERY STAGE OF GEAR PRODUCTION



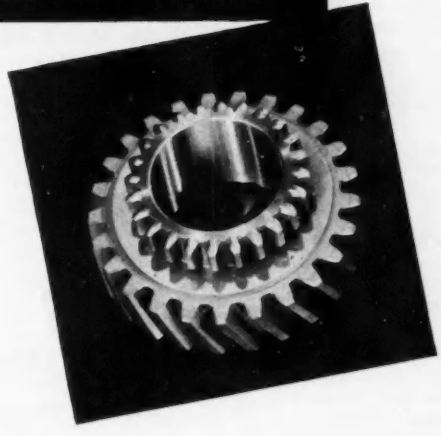
Forging Splits Diminished

Bethlehem Alloy Steels are exceptionally free from surface flaws or internal voids that might open up during forging operations. Billets are cooled slowly in bung-type furnaces and carefully scarfed or chipped.



More Pieces Machined per Tool

Bethlehem Alloy Steels are as clean internally as modern methods can make them. Inclusions are held to a minimum so that a higher percentage of acceptable pieces per tool can be machined on modern gear shapers.



Heat Treated with Minimum Distortion

The analysis and grain size of Bethlehem Alloy Steels are rigidly controlled by means of advanced mill practices and modern testing methods to insure uniform response to heat treatment with minimum distortion.

Bethlehem Alloy Gear Steels, both carburizing and oil-hardening grades, are readily available. Our metallurgists will gladly help you solve any problems concerning the selection, forging, machining, or treatment of these steels.

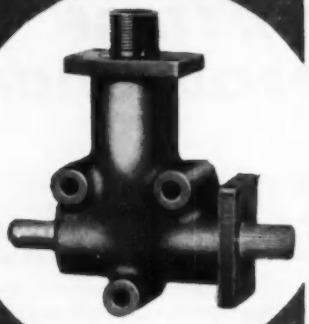
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

★ BETHLEHEM STEEL ★

BETHLEHEM ALLOY STEELS

the new ANGL Gear



STANDARDIZED RIGHT ANGLE GEAR UNIT with UNIVERSAL MOUNTING

1. Flex. Shaft Adapter (Available Any End)
2. Flanged End Mountings
3. Internal Pilot on Mounting Ends
4. 5/16"-SAE Serrated Shaft on Any End (Available)
5. Pressurized Shaft Seal Either Mounting End (Available)
6. Hardened Gears and Anti-Friction Bearings Lubricated for Life. Rated ⅓ H.P. at 1800 RPM
7. 3 Bolt Side Mountings
8. Standard ⅜" Plain Shaft Extentions
9. 1 : 1 Ratio Standard — 2 : 1 Ratio Optional
   250 In. Lbs. Static Torque — 500 In. Lbs. Available

AIRBORNE
ACCESSORIES CORPORATION
25 MONTGOMERY ST. • HILLSIDE 5, NEW JERSEY
HOLLYWOOD, CAL. • DALLAS, TEX.
OTTAWA, CAN.

warded to the Society of Automotive Engineers for approval and it is understood they will appear in an early issue of the SAE handbook.

One of the characteristics of belt operation with which the automotive industry is very much concerned is running noise. For years belts have given considerable annoyance from the so-called idle squeak. This is a type of noise which occurs when the engine is operating at approximately 500 rpm on the crank shaft and occurs in intermittent chirps. There are other types of V-belt running noises, such as V-belt squeal, rattle and howl.

In an attempt to eliminate or at least reduce some of these noises, Goodyear sponsored a noise program at the Armour Research Foundation of Chicago. The program was placed at an independent research laboratory in preference to the Goodyear laboratories so that it would be open for inspection at all times to any of the automotive engineers interested in the project and it was further believed the reports from the foundation known to be unbiased would be of most value.

Space does not permit in this brief article to go into detail as to the complete report on V-belt running noise but the results of the investigation were very gratifying. All of the test results were recorded on wire and serve as a permanent record for belts operating under various conditions.

During these tests it was found impossible to obtain any type of running noise from the wedge type belt and the typical V-belt squeak was definitely eliminated. Briefly, it was concluded from the tests that the following tended to induce V-belt squeak:

(1) Misalignment of pulleys.
(2) Non-uniform pulley grooves.
(3) Eccentric pulleys.
(4) Improper fit of belt in pulley.
(5) Belts of crooked cross section.
(6) Column of air between bottom of belt and base of pulley acting as resonator.

It was also proved that the following factors are completely independent of V-belt squeak and in no way contribute to it:

(1) Type of pulley material.
(2) Natural frequency of vibration of pulleys.

Tests on wedge type of belt revealed that under conditions similar to those which caused sqeak in the trapezoidal type of belt, no squeak occurred. Up to the present time this type of belt has been used in production on Cadillac, Oldsmobile, Kaiser-Frazer, Nash, Ford, Mercury and Lincoln.

In concluding, it is believed that the wedge type of belt offers to the automobile industry a belt drive system which has a longer life, saves space and weight, and will ultimately be considerably cheaper than the present type of drive. These features are already a reality on many of the models at the

(*Turn to page 88, please*)

Qualified
for any heavy production job

Scoring on three important points; —scientific design, rugged construction and proper installation, Layne Well Water Systems are generously qualified for the heaviest production jobs on record. Furthermore, once installed, these systems keep right on providing good service for years and years. Records show that upkeep cost, in the majority of installations, is almost non-existent. All installations are exclusively by Layne Associated Companies whose engineers and field crews are widely experienced and thoroughly qualified. All contracts cover the job complete, including the final testing of the unit to assure Layne engineers and the buyer that the System is satisfactory in every way. For further information, catalogs, folders, bulletins etc., address

LAYNE & BOWLER, INC.
GENERAL OFFICES, MEMPHIS 8, TENN.

LAYNE
WELL WATER SYSTEMS
VERTICAL TURBINE PUMPS

ASSOCIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. • Layne-Atlantic Co., Norfolk, Va. • Layne-Central Co., Memphis, Tenn. • Layne-Northern Co., Mishawaka, Ind. • Layne-Louisiana Co., Lake Charles, La. • Louisiana Well Co., Monroe, La. • Layne-New York Co., New York City • Layne-Northwest Co., Milwaukee, Wis. • Layne-Ohio Co., Columbus, Ohio • Layne-Pacific, Inc., Seattle, Wash. • The Layne-Texas Co., Ltd., Houston, Texas • Layne-Western Co., Kansas City, Mo. • Layne-Minnesota Co., Minneapolis, Minn. • International Water Corporation, Pittsburgh, Pa. • International Water Supply, Ltd., London, Ont., Can. • Layne-Hispano Americana, S. A., Mexico, D. F. • General Filter Company, Ames, Iowa

KELSEY-HAYES
Truck Wheel
with Improved 3 piece rim

For SAFER and EASIER
Tire Mounting and Dismounting
Tube Insertion, Wheel Assembly
and Ring Locking

Increases
TIRE MILEAGE 20% to 50%...CUTS INSTALLATION and SERVICING COSTS

Available in all Popular Sizes for Leading Makes of Trucks

...ASSURES PROVEN PRODUCTS...
KELSEY-HAYES WHEEL COMPANY

DETROIT 32, MICHIGAN

PRODUCTS: Wheels—Hub and Drum Assemblies—Brakes—Vacuum Brake Power Units—for Passenger Cars, Trucks, Buses—Electric Brakes for House Trailers and Light Commercial Trailers—Wheels, Hubs, Axles, Parts for Farm Implements.
PLANTS: Kelsey-Hayes Plants in Michigan (4); McKeesport, Pa.; Los Angeles, Calif.; Davenport, Iowa; Windsor, Ontario, Canada.

present time and in the near future will be true for most models.

The belt because of its size may be operated on smaller diameter pulleys although this is not recommended. It is also possible to increase the speed of the belt because of its light section. The centrifugal force does not have as much effect on the tension members because of its lightness as it does on standard belts.

The so-called idle squeak which has given so much trouble in past years has for all practical purposes been eliminated. The power loss has been reduced considerably because of the reduction of operating temperatures. Standard automotive drives have a reduction of as much as 50 deg to 60 deg F compared to standard drives.

Adoption of standard grooves means more interchangeability, reduction of service stock required, and simplification of design—also more flexibility, as steel cable belts when required can replace rayon belts for these higher capacity drives — using the same pulleys.

In general, it is believed the V-belt industry has contributed a new chapter in the design and manufacture of automotive V-belt drives from which all concerned will benefit.

NEW PRODUCTS

For additional information please use coupon on page 62

(*Continued from page 60*)

K-149—Midget Coolant Separator

Midget magnetic coolant separator No. 00 developed by Barnes Drill Co., Rockford, Ill., to satisfy the need for consistently clean coolant on small machines having a coolant capacity of 1½ gpm or less. Small and compact, it can be placed in the coolant storage tank to remove the metal particles and fused abrasive from the work produced on small honing, grinding and threading machines. The midget model supplements the line of Barnesdril magnetic coolant separators having 5, 10, 20, 40, 70, 120 and 350 gpm capacities.

THE right casting for you might be an aircraft part a rubber goods part textile machinery automotive portable tool application implement or vacuum cleaner part.

The right casting might well be a light casting.

There are several good reasons why it *will* be right if it's *Well-Cast*, in either aluminum, magnesium or bronze:

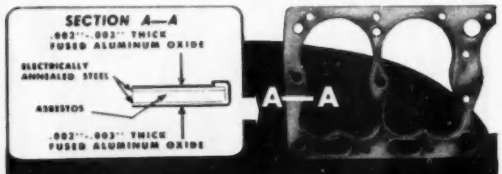
- Our 40 years experience
- 3 complete plants
- A national reputation for good service
- The economy-in-use of light metals
- A long list of satisfied customers
- Facilities to produce sand, semi-permanent or permanent mold castings

Let's hear from you. Tell us your problem and we'll tell you whether a light casting is the right casting. *Catalog No. 50 on request.*

Well-Made Wood and Metal Patterns

THE WELLMAN
Bronze & Aluminum Co.
2503 EAST 93rd STREET
CLEVELAND 4, OHIO

BUY BONDS



FOR A LASTING, PERFECT SEAL IN HIGH COMPRESSION ENGINES
Use Only

Fitzgerald Metallic Aluminum-Fused-Oxide Steel Asbestos Gaskets*

Grease Retainers — Cork Gaskets

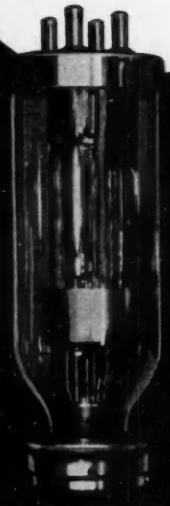
FITZ-Rite* Treated Fiber Gaskets for oil, gasoline and water connections. Complete Sets For Motor Rebuilders. *Service Mark Registration Pending

FITZGERALD *Gaskets*
SINCE 1906
The Fitzgerald Manufacturing Company
TORRINGTON, CONNECTICUT

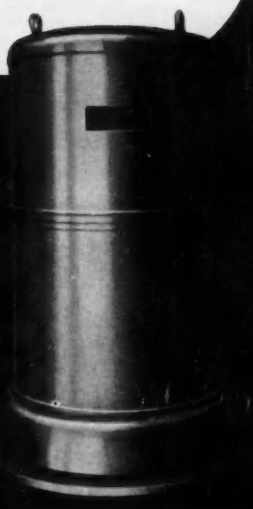
There's a Fitzgerald Gasket for every Engine

When considering Induction Heating Equipment for Hardening, Brazing, Soldering, Annealing, Forging, or Melting—

remember



TUBE OSCILLATORS
for radio frequencies, nominally 450,000 cycles per second.



MOTOR GENERATORS
for frequencies up to 10,000 cycles per second.

TOCCO, since it manufactures both the motor-generator and tube oscillator type induction heating unit, (60 cycle equipment, too, when needed) offers you a completely unbiased equipment recommendation—the right equipment to help you cut costs, speed production and improve product quality.

THE OHIO CRANKSHAFT COMPANY

TOCCO

Mail Coupon Today

NEW **FREE** BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. H-6, Cleveland 1, Ohio

Please send copy of "A TOCCO Plant Survey—Your Profit Possibility for 1950"

Name_____

Position_____

Company_____

Address_____

City_____ Zone____ State____

61 DRILLING, CHAMFERING, REAMING AND TAPPING OPERATIONS

Completed automatically in 52.9 seconds on

BARNES 13-STATION PROGRESS-THRU MACHINE...

Eight-cylinder automobile engine block. Machining operations in both ends are performed automatically.

This W. F. & John Barnes Progress-Thru Machine is another recent special production unit designed and built for machining automobile engine blocks. It completes automatically a total of 61 operations in both ends of the workpiece in a cycle time of 52.9 seconds. Gross production is 68 blocks per hour. Loading and unloading is performed during the machining cycle.

Straddle Station Units Cut Costs

Blocks are fed through the machine lengthwise in an upright position with pan rail down and are clamped securely by vertical hydraulic units.

Seven multiple spindle heads of the machine are designed as straddle station units. Operations are split so that each of these heads works on two different blocks simultaneously. This reduces the number of units, saves floor space, permits greater accessibility, and provides obvious savings in equipment costs. Savings in maintenance time is also provided by locating electrical conduits and hydraulic piping above the Progress-Thru fixture.

SEQUENCE OF AUTOMATIC CYCLE

Station Number	Left-Hand Heads	Right-Hand Heads
1	LOAD	
2	Drill 2 - .4844, 2 - .368, 3 - .4687, 1 - .5937 (oil gallery).	Drill 8 - .316, 1 - .1875 oil hole .62 deep, Comb. core drill and chamfer 1 - 1⅜.
3	Drill 1 - .5781 (oil gallery), chamfer 2 - .368 dia.	Chamfer 6 - .316 dia., ream 1 - 1¼", drill 2 for .370 ream.
4	IDLE	IDLE
5	Drill 1 - .5781 (oil gallery).	Chamfer 2 - .316 holes, drill - 1 - .5937 (oil gallery), 3 - .316.
6	Drill 1 - .5781 (oil gallery).	Drill 1 - .5781 (oil gallery), chamfer 3 - .316 holes.
7	IDLE	IDLE
8	Drill 1 - .5781 (oil gallery).	Drill 1 - .5781 (oil gallery).
9	Drill 1 - .4687.	Drill thru 1 - .5781
10	IDLE	IDLE
11	IDLE	Tap 9 - ⅜—16.
12	Tap 1 - ⅜ straight pipe, 2 - ⅞—14.	Tap 1 - ⅜ straight pipe, 2 - ⅜—16.
13	UNLOAD	
Total	18	43

Ask For An Analysis of Your Machining Methods

Find out how these and other Barnes designed machines may be applied to cut costs in your shop. Ask for an analysis of your methods.

W. F. & JOHN BARNES

W. F. and JOHN BARNES

312 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

LEAD ACCURACY

WITHIN .0001" PER INCH
IS NOT UNCOMMON...

IN

Hanson-Whitney

"FINISHED"

TAPS

The accompanying illustration shows perfect contact between the nut (internal) and the screw (external) threads... when lead, angle and diameters of both are correct.

Especially important in achieving this result is Lead Accuracy in the nut ... obtainable only when "Finished" taps have been used in tapping the nut.

Hanson-Whitney "Finished Taps", finished after hardening... with thread lead accuracy within .0001" per inch, together with correct form and diameters, will give you tapped holes of greatest accuracy... so necessary for today's production and assembly operations.

Hanson-Whitney equipment for producing "Finished Taps" adequately covers the entire tap field. Diameters from 1/16" to 7½", and leads from 100 threads per inch to one thread in 7" can be produced. No better taps are made.

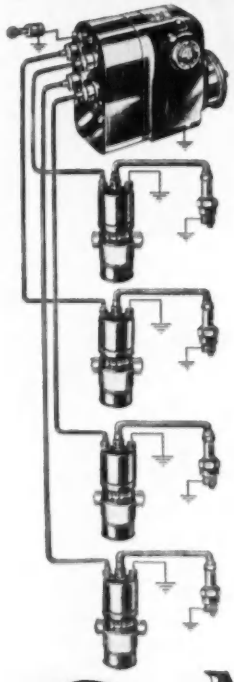
HANSON-WHITNEY COMPANY, HARTFORD 2, CONN., Division of the Whitney Chain Company

Valuable engineering, illustrated Catalog on request. Please use your business stationery.

Hanson Whitney

PIONEERS OF FINISHED TAPS

BHW50



A NEW LOW TENSION MAGNETO IGNITION SYSTEM FOR LARGE, SPARK IGNITED ENGINES!

The System comprises the new American Bosch MRB Low Tension, shielded Magneto with individual High Tension Ignition Transformers mounted at each engine cylinder (as shown in diagram of 4-cylinder installation at left). Low tension current, generated in the Magneto, is distributed through low tension leads to the Transformers where the electrical energy is converted to high voltage and conducted to the spark plugs by short cables—shielded if desired. The rugged, heavy-duty high tension Transformers are available with or without shielding (as illustrated) to suit specific installation needs.

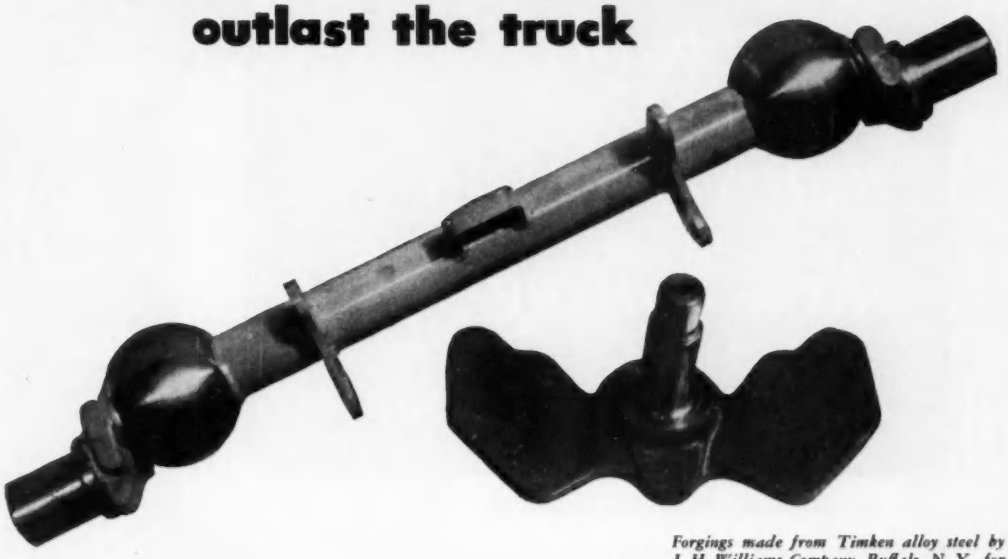
Energy losses and corona effects which occur with long high tension cables are eliminated in this new, versatile Low Tension System. The possibility of fire and explosion hazard is minimized where engines operate in combustible oil or gas vapors . . . radio and television interference may be greatly reduced by complete shielding. These important features, combined with the outstanding mechanical and electrical characteristics of the new American Bosch Low Tension Magneto assure maximum spark efficiency for stationary engines operating under the severest conditions. Write for complete details and examine the many sales-active advantages this new Low Tension Ignition System offers as original equipment on *your* large, spark ignited engines.

American Bosch

MAGNETOS • GENERATORS • VOLTAGE REGULATORS • IGNITION COILS
ELECTRIC WINDSHIELD WIPERS • DIESEL FUEL INJECTION EQUIPMENT

AMERICAN BOSCH CORPORATION • SPRINGFIELD 7 • MASS.

Forgings made of TIMKEN® steel help Truxmore 3rd axle outlast the truck



Forgings made from Timken alloy steel by J. H. Williams Company, Buffalo, N. Y., for Truck Equipment Company, Buffalo, N. Y.

ONE reason why Truxmore 3rd Axle assemblies can outlast as many as five different chassis is the forgings shown above.

These two vital parts of the assembly have to carry extremely heavy loads in high speed, heavy duty transportation service. Yet they have lasted for hundreds of thousands of miles in actual operation. A big share of the credit goes to the steel they're made from—Timken® forging bars.

Each analysis of Timken forging bars has uniform forgeability, uniform chemical and physical properties, and uniform response to heat treatment—from bar to bar and from heat to heat. Surface and internal quality are uniformly superior. This uniformity is assured by The Timken Roller Bearing Company's complete, rigid quality control—from melt shop through final inspection.

As a result, the finished forgings have uniform, high quality. And they can be made at lower cost—through fewer delays, rejects and changes in shop practice.

Find out how Timken forging bars can help you make better forgings at less cost. Consult our Technical Staff. Also write for our free, authoritative booklet, "Evaluating the Forgeability of Steels". The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing.

How many different sleeve bearing alloys do you use?

We specialize in variety . . . in sleeve bearings and bushings. Half a century's experience has shown us that there is no universal bearing alloy to fit all needs. One automotive engine, for example, might require tin base lining for main bearings, while another might require copper-lead lining. One tractor manufacturer calls for cast, full-round piston pin bushings while another prefers rolled-type split bushings. Electric motors, Diesel locomotives, marine engines and ditch diggers all have their own special requirements. Instead of making just one type of bearing and trying to fit it to all needs, we produce "tailor-made" bearings to meet your performance specifications.

Our seven manufacturing plants are equipped to produce sleeve bearings and bushings in a wide variety of material combinations, and in many sizes—in quantities ranging from dozens to millions.

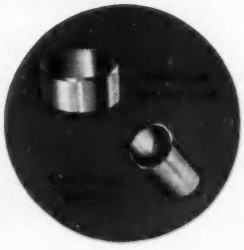
Send for our Bulletin showing the "Field of Usefulness" chart for a wide range of bearing alloys. It provides a "ready reference" on bearing applications for your library.

FEDERAL-MOGUL CORPORATION • 11037 SHOEMAKER, DETROIT 13, MICH.

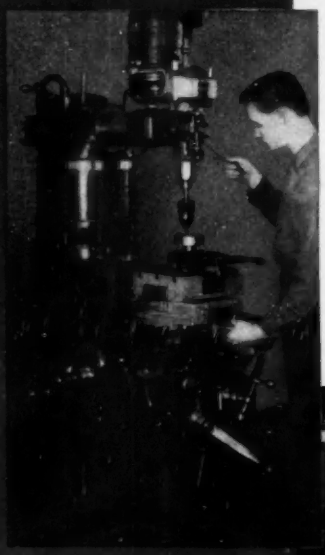
Silent **SLEEVE BEARINGS**

FEDERAL-MOGUL

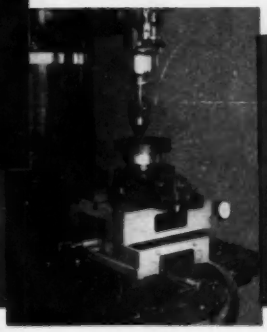
OVER FIFTY YEARS OF CONTINUOUS BEARING EXPERIENCE

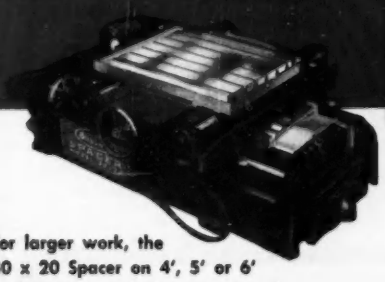


That little 4 x 4 — BULLARD SPACER ... does it do a JOB!



Drill spacing with jigs is now proved to be an expensive art compared to the semi-automatic spacing with Bullard Spacer. No need for designing and making jigs for new jobs. Even throw out the old jigs and operational savings will start.





For larger work, the 30 x 20 Spacer on 4', 5' or 6' Radial Drills with Accurate Spindles.

The complete story is told in Bullard's 16 MM. sound film entitled, "Interchangeability Without Jigs."

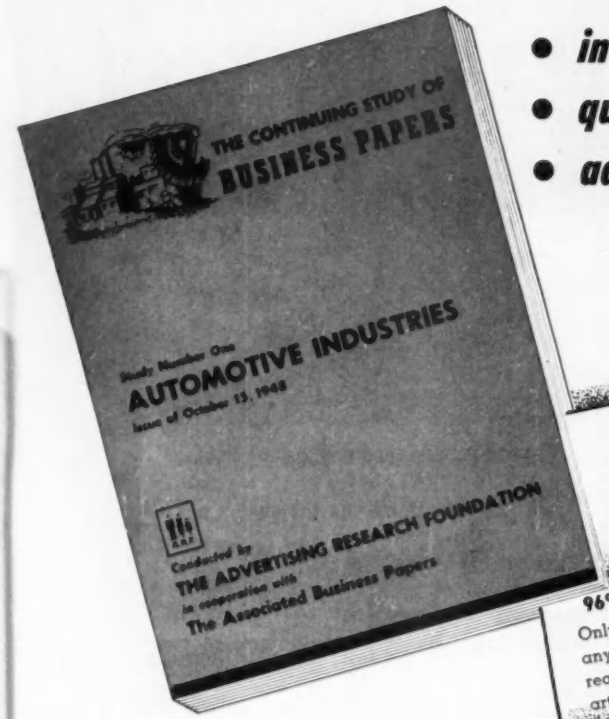
Write for literature on Bullard Spacers. Two sizes, 30 x 20" and 4 x 4".

THE BULLARD COMPANY

Here's Page After Page of PROOF

of AUTOMOTIVE INDUSTRIES'

- *intense readership*
- *quality circulation*
- *advertising effectiveness*



89% QUALIFIED AS READERS

89% of claimed readers passed the rigid reader qualification test. Study included "pass-along" readers and subscribers.

96% READ THE ADVERTISEMENTS

Only 4% of the qualified readers did not read any of the ads in the October 15th issue. All readers had read one or more of the editorial articles.

75% INFLUENCE PURCHASING

Three-quarters of the readers directly enter into or make recommendations in the purchase of parts, materials, supplies, plant and production equipment.

81% SPECIFY BRANDS OF PRODUCTS

81% of the readers influential in purchasing specify makes or brands of the products they buy in over 3000 automotive plants.

66% PASS ALONG THEIR COPIES

Two-thirds of the readers pass along their copies to others for reading and 76% of these pass along the copies, providing deep penetration.

The A. R. F. readership study of AUTOMOTIVE INDUSTRIES is the most intensive survey ever made on any industrial publication. It offers full information on readership, on subscribers and readers, their purchasing influence, "pass-along" circulation, and advertising readership.

And . . . the results of the A. R. F. study indicate that AUTOMOTIVE INDUSTRIES penetrates effectively the buying power of the $12 billion industrial automotive field AUTOMOTIVE INDUSTRIES . . . the magazine of proved readership . . . reaches over 11,400 engineering, production and administrative executives in more than 3000 automotive manufacturing plants, America's most active industrial field.

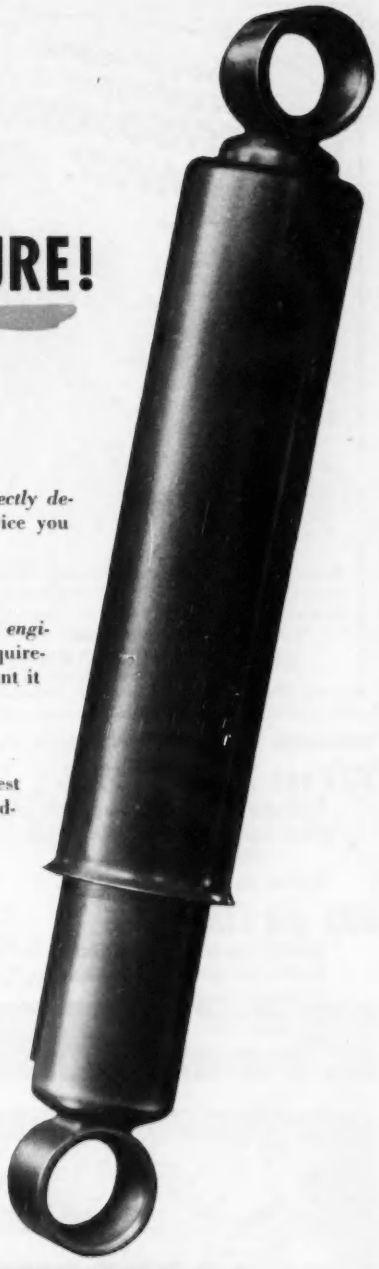
AUTOMOTIVE INDUSTRIES

A CHILTON Publication

CHESTNUT AND 56th STREETS, PHILADELPHIA 39, PA.

. . . the Automotive Industrial News Magazine

Specify HOUDAILLE* and be SURE!



SURE of a shock absorber that's *correctly designed* for the dependable service you have a right to expect.

SURE of an instrument that's *expertly engineered* to meet your individual requirements and do the exact job you want it to do.

SURE of *precision workmanship* with the finest of materials to insure quality, dependability and long life.

SURE of *exacting inspection* to guarantee the uniformity within the closest of tolerances of each and every last shock absorber delivered for your use.

In short, work with Houdaille in the solution of your shock absorber problems —and be SURE that once solved, you can forget them.

* Say "Hoo-dye"

HOUDAILLE-HERSHEY CORPORATION
HOUDE ENGINEERING DIVISION
BUFFALO 11, NEW YORK
America's Pioneer Builder of Hydraulic Shock Absorbers

HANDIEST ADDRESS IN PITTSBURGH IS THE PITTSBURGHER HOTEL

400 Rooms each with free radio, bath and circulating ice water. Garage service

Singles from $4.00
Doubles from $6.00

Conveniently located in downtown Pittsburgh, it is quickly reached from highways, railroad stations and airports. In the immediate vicinity are theatres, department stores and important office buildings.

A KNOTT HOTEL
PITTSBURGH 30, PA.
JOSEPH F. DUDDY, MANAGER

Over 20 Years Experience

BUS and TRAILER PARTS

License Plate Holders (large and small)
Ventilators, Ventilator Grills (inside and outside control)
Marker Lights (large and small)

DIES and STAMPINGS

Quality Dies from the smallest up to 2000 lbs.
Quality Stampings 225 ton capacity, 5⅞ in. draw

THE HP AND DIE and STAMPING CO.
13943 TRISKETT ROAD • CLEVELAND 11, OHIO

WILLIAMS

DROP-FORGINGS

ANY SHAPE • ANY MATERIAL • COMPLETE FACILITIES

Write for Free Forging Data Folder . . . Helpful, Informative

J. H. WILLIAMS & CO., "The Drop-Forging People" BUFFALO 7, N.Y.

STOP LOSSES

Simply brush on right at bench ready for layout in few minutes. Dark blue background makes scribed layout lines show up in sharp relief. Also prevents metal glare, increasing efficiency and accuracy. Write for details.

MAKING DIES & TEMPLATES WITH DYKEM STEEL BLUE

The DYKEM CO., 2301L North 11th St., St. Louis 6, Mo.

FELLOWS

Fellows

MACHINES AND TOOLS FOR GEAR PRODUCTION

The Fellows Gear Shaper Company, Springfield, Vt.

RACING FUEL FORMULAS

New Book Just Off The Press

Fuel secrets, all about methanol, alcohol, benzol, toluene, ethers, gasoline, etc. For hot-rods, motorcycles, sport cars, midgets and Indianapolis cars. Special carburetors, ignition systems, gas savers, water injection and overdrive conversions.

WHITE & LANGNECKER
2502 TWELFTH AVENUE BEAVER FALLS, PENNA.

$1.00

TRACK SUPPLIES STRUCTURAL STEEL RAILS

RAILS *New and Relaying!*

TRACK MATERIALS AND ACCESSORIES CARRIED IN STOCK

Switch Material • Spikes and Bolts • Track Tools • Ties • Tie Plates • Bumpers • Complete Side Tracks

BUILDERS STEEL SUPPLY CO.
4201 WYOMING • P.O. BOX 188 • DEARBORN, MICH.

SEND US YOUR INQUIRIES

ACADIA Synthetic PRODUCTS

DIVISION OF WESTERN FELT WORKS

WESTERN FELT WORKS
4035-4117 Ogden Ave., Chicago 23, Ill.
Offices in Principal Cities

Synthetic rubber extrusions—molded shapes—sheets. Cut parts produced to closest tolerances and S.A.E.; A.S.T.M. specifications.

BESLY-TITAN ABRASIVE WHEELS

Made to Meet Your Individual Production Requirements

The Besly man in your territory may be able to show you how to get a better finish, closer tolerance, increased output, lower costs—or all four. Write us.

CHARLES H. BESLY CO., 118 North Clinton Street, Chicago 6, Illinois

WORCESTER STAMPED METAL © QUALITY STAMPINGS WORCESTER STAMPED METAL ©

Heavy, medium and light stampings in any quantity.
A steady flow of production . . . *when* you want it.

WORCESTER STAMPED METAL CO., 9 HUNT STREET, WORCESTER, MASS.

BUY BONDS

NEW MILSCO MODELS

More Features ★ Improved Comfort ★ Economy

The Milsco seats illustrated are typical of the standard Milsco line for various types of mobile equipment. New features combine extra comfort and serviceability. Sturdy metal frames; Foam Rubber padding with a choice of durable covering materials; easy installation. If your equipment requires special seating, our Engineering Department will gladly work with you. Put our years of specialized seating experience to work . . . without obligation.

Our 25th Year

MILSCO MANUFACTURING COMPANY
2730 N. 33rd ST., MILWAUKEE 10, WISCONSIN

Polk New Car Sales Reports

your own private registration service

Most useful business statistical reporting service of any industry! Reports not only total new car and truck registrations, by county and state and nation, but also breaks that information down by makes of cars, by price classes, by parent corporations, by cylinder models—and compares that information with last year's figures for the same time and states! Use this invaluable guide in determining your sales quotas, in watching what competition is doing, in gauging service potentials, in ordering parts and accessories. Write, wire or phone for details on this new, comprehensive service, and how it can be applied to YOUR business.

R. L. POLK & CO. *Serving the automotive industry and its dealers since 1923*

MOTOR STATISTICAL DIVISION – 431 HOWARD STREET, DETROIT 31, MICHIGAN

Acadia Div. Western Felt Works 98
Accurate Spring Mfg. Co..... —
Acushnet Process Company... —
Aetna Ball & Roller Bearing Co. 64
Airborne Accessories Corp.... 86
Ajax Manufacturing Co., The —
Allied Products Corp..... 75
Aluminum Co. of Amer..... —
Aluminum Industries, Inc..... —
American Bosch Corp..... 92
American Broach & Machine Co. ..... —
American Chain & Cable Co. —
American Chemical Paint Co. —
American-Fort Pitt Spring Div. ..... —
American Steel & Wire Co. —
Amgears, Inc. ..... —
Anderson Co., Inc., O. L..... —
Armstrong Cork Co..... —
Associated Spring Corp...../ 7
Automotive Gear Works, Inc. 27
Automotive Industries 96

Baird Machine Co., The..... 26
Barber-Colman Co. ..... —
Barnes Co., Wallace 7
Barnes, W. F., & John..... 90
Barnes-Gibson-Raymond 7
Bendix Aviation Corporation
Bendix Products Div..... 11
Eclipse Machine Div..... —
Stromberg-Elmira Div. .... —
Zenith Carburetor Div. .... —
Bendix-Westinghouse Automotive Air Brake Co..... —
Besly & Co., Chas. H..... 98
Bethlehem Steel Co..... 85
Black & Decker Mfg. Co., The
Blake & Johnson Co..... —
Blakeslee & Co., G. S..... 74
Borg & Beck Div..... —
Borg-Warner Corp. 79
Bower Roller Bearing Co..... —
Brandt, Inc., Chas. T..... 72
Bridgeport Brass Co..... —
Brown Corp., The..... 78
Builders Steel Supply Co..... 98
Bullard Company, The..... 95
Bundy Tubing Company..... —
Bunell Machine & Tool Co.... 29
Burlington Mills, Inc..... —

Campbell, Wyant & Cannon Foundry Co. ..... —
Carboloy Company, Inc..... —
Carnegie-Illinois Steel Corp.. —
Central Screw Co. ..... —
Centrifugal Foundry Co..... —
Chambersburg Engineering Co. —
Chicago Rawhide Mfg. Co.... —
Chicago Rivet & Machine Co. —
Chicago Screw Co., The..... 76
Cincinnati Milling Machine Co. 16
Clark Equipment Co..... —
Clearing Machine Corp..... —
Cleveland Punch & Shear Wks. Co. ..... —
Climax Molybdenum Co..... 84
Columbia Steel Company..... —
Columbus Coated Fabrics Corp. —
Cone Automatic Machine Co... —
Continental-Diamond Fibre Co. ..... —
Continental Motors Corp..... —
Continental Tool Works Div... —
Cotta Transmission Co..... 1
Crane Packing Co..... —
Cross Company, The..... 12
Cummins Engine Co., Inc..... —

Danly Machine Specialties, Inc. 9
Davis & Thompson Co..... —
Detroit Gasket & Mfg. Co..... 28
Detroit Harvester Company.. —
Diesel Equipment Div. G. M... 68
Disston & Sons, Inc., Henry.. —
Dole Valve Co., The..... —
Donaldson Co., Inc..... —
Dow Chemical Co..... —
Dow Corning Corp..... 83
Driv-Lok Pin Co..... —
Dunbar Brothers Co..... 7
du Pont de Nemours & Co., Inc., E. I. ..... —
Dykem Co., The..... 98

Eaton Manufacturing Co..... 13
Elastic Stop Nut Corp..... —
Elco Tool & Screw Corp..... —
Electric Auto-Lite Co., The.. —
Electric Furnace Co., The.... —
Electric Storage Battery Co.. 55
Ex-Cell-O Corp. 11

Fafnir Bearing Co., The..... —
Fairfield Mfg. Co..... —
Federal-Mogul Corp. 94
Fellows Gear Shaper Co., The 98
Fitzgerald Mfg. Co., The..... 88
Fram Corp. ..... —
Fuller Manufacturing Co. ... —

G & O Mfg. Co., The..... —
Galland-Henning Mfg. Co..... —
Garrett Co., Geo. K..... —
General Controls ..... —
General Electric Company...65-66
Gibson Co., Wm. D. 7
Globe-Union, Inc. ..... —
Great Lakes Steel Corp..... —
Greenlee Bros. & Co..... —
Gunite Foundries Corp..... —

H & P Die & Stamping Co.... 98
Handy & Harman ..... —
Hannifin Corp. ..... —
Hanson-Whitney Company... 91
Harrison Radiator Division... 77
Hartford Steel Ball Co., The.. 82

Index to

The Advertisers' Index is published of the advertising contract. Every rectly. No allowance will be made

Heald Machine Co., The..... —
Heli-Coil Corp. ..... —
Herbrand Division, The Bingham-Herbrand Corp. ..... —
Hollingshead Corp. ..... —
Hoover Ball & Bearing Co.... —
Hotel Cleveland 84
Hotel Pittsburgher 98
Houde Engineering Div..... 97
Houghton & Co., E. F..... 81
Hyatt Bearings Div. ..... —

Ingersoll-Rand Co. ..... —
Inland Manufacturing Div.... 6
Inland Steel Company ..... —
International Nickel Co., Inc.. 2

Johnson Bronze Co..... —
Johnson Mfg. Corp. ..... —
Johnson Products, Inc..... —
Jones & Laughlin Steel Corp.. —

Kelsey-Hayes Wheel Co..... 87
Kerson Co., Inc., N. A. ..... —
Kester Solder Co. ..... —
King-Seeley Corporation .... —

Kopp Glass, Inc. ..... —
Kropp Forge Company ..... —

Lamb Electric Company..... —
Layne & Bowler, Inc..... 86
Leeds & Northrup Co..... —
Lipe-Rollway Corp. ..... —
Littelfuse, Inc. ..... —
Littell Machine Co., F. J..... —
Long Manufacturing Div .... —
Lord Manufacturing Co..... —

Magnaflux Corp. ..... —
Mahon Co., The R. C..... —
Mallory & Co., Inc., P. R..... —
Matthews & Co., Jas. H..... 102
Mattison Machine Works.... —
Mechanics Universal Joint Div. ..... —
Meletron Corporation 102
Michigan Steel Tube Products Co. ..... —
Michigan Tool Company 10
Micromatic Hone Corp. ..... —
Midland Steel Products Co.... —
Milsco Manufacturing Co..... 99
Moraine Products Div. ..... —
Muskegon Piston Ring Co..... —

N-A-X Alloy Division..... —
Nadella ..... —
National Acme Co., The..... 71
National Broach & Machine Co. ..... —
National Motor Bearing Co.... —
National Steel Corporation... —
National Tube Company..... —
New Britain Machine Co..... —
New Departure Div. ..... —
Niagara Machine & Tool Wks. —
Norton Company ..... —

Oakite Products, Inc..... —
Ohio Crankshaft Co., The..... 80
Ohio Division 7
Ohio Seamless Tube Co..... —
Oliver Instrument Co. ..... —

Page Steel & Wire Div., Amer. Chain & Cable Co., Inc..... —
Palnut Company, The..... —
Parker Rust Proof Co..... —
Pedrick Piston Rings 69
Perfect Circle Corp. ..... —
Pesco Products Div. Borg-Warner Corp. ..... —
Pierce Governor Co., Inc..... —
Pittsburgh Steel Products Co. —
Polk & Co., R. L..... 99
Potter & Johnson Co..... —
Pratt & Whitney Div., Niles-Bement-Pond Company 59
Purolator Products, Inc..... —

Quinn-Berry Corp. ..... —

Ramsey Corporation ..... —
Raybestos-Manhattan, Inc (Equipment Sales Div.)..... —
Raymond Mfg. Co. 7
Redmond Co., Inc..... —
Revere Copper & Brass, Inc... —
Reynolds Wire Co. ..... —
Richards Co., J. A..... —
Rinshed-Mason Company..... —
Rockford Clutch Div..... —
Ross Gear & Tool Co..... —
Ryerson & Son, Inc., Joseph T. —

SKF Industries, Inc..... —
Saginaw Steering Gear Div.... —
Schmieg Industries, Inc..... —
Scovill Mfg. Co..... —
Sealed Power Corporation.... —
Seneca Falls Machine Co..... 5
Service Spring Co. ..... —
Set Screw & Mfg. Co..... —
Shakeproof, Inc. ..... —
Shore Instrument & Mfg. Co. —
Shuler Axle Co. ..... Back Cover
Simonds Abrasive Co..... —
Snyder Tool & Engineering Co. —
Spicer Mfg. Div. Dana Corp.. 61
Stalwart Rubber Co., The.... 80
Standard Oil Co. (Ind.) Second Cover
Standard Tube Co., The..... —
StéAme des Roulements a Aiguilles ..... —
Sterling Aluminum Products, Inc. 63
Strom Steel Ball Co..... 70
Stuart Oil Co., Ltd., D. A..... —
Sun Oil Company ..... —
Sunstrand Machine Tool Co... —
Superior Steel Corp. ..... —

Taylor Dynamometer & Machine Co. ..... —
Taylor Fibre Co. ..... —
Tennessee Coal, Iron & R. R. Co. ..... —
Texas Company, The..... 4
Thompson-Bremer & Co... .. —
Timken Roller Bearing Co., The 93
Tomkins-Johnson Company, The ..... —
Torrington Co., The ..... —
Tourek Mfg. Co., J. J..... —
Towmotor Corp. ..... —
Tung-Sol Lamp Works, Inc... —
Tuthill Pump Co..... —
Tuthill Spring Co..... 67
Twin Disc Clutch Co..... —

United Specialties Company.. 8
United States Rubber Co..... —
United States Steel Corp..... —
Universal Products Co., Inc... 73

Vanadium Corp. of Amer..... —
Vellumoid Co. ..... —
Verson Allsteel Press Co..... —
Vickers, Inc. 57
Victor Manufacturing & Gasket Co. ..... —

Waldes-Kohinoor, Inc. ..... —
Waukesha Motor Company... —
Wean Equipment Corp..... —
Wellman Bronze & Aluminum Co., The 88
Western Felt Works..... 98
Wheland Company, The..... —
White & Langnecker 98
Wilkening Mfg. Co..... 69
Williams & Co., J. H..... 93
Wisconsin Motor Corp..... —
Wittek Mfg. Co. 80
Worcester Stamped Metal Co.. 98
Wrought Washer Mfg. Co.... —
Wyman-Gordon ..... —

Yates-American Machine Co.. —
Young Radiator Company.... 3

Zollner Machine Works..3rd Cover

Advertisers

as a convenience, and not as part care will be taken to index cor- for errors or failure to insert.

Are your workmen positive every time they open a valve or repair a pipeline that a safe material is flowing through? There's no margin for error, and you can help prevent costly accidents by using Matthews' SAFETY TAGS . . . for instant identification.

Recommended colors used by NATIONAL SAFETY COUNCIL.

RED, GREEN, YELLOW, BLUE, PURPLE

Inexpensive, permanent Matthews' SAFETY TAGS, installed on every exposed pipeline, and every valve or junction, offer triple protection . . . the distinct shape, the brilliant color and the inscription you specify are your guarantee of instant and positive recognition of the type of material flowing through the pipeline. Don't take chances . . . write Matthews today for complete information, Bulletin D-4914 and sample SAFETY TAGS.

JAS. H. MATTHEWS & CO.

3986 FORBES ST., PITTSBURGH 13, PA.

NEW YORK · BOSTON · PHILADELPHIA · CHICAGO
NEWARK · SYRACUSE · CLEVELAND · CINCINNATI
DALLAS · BIRMINGHAM · LOS ANGELES

MELETRON

FUEL PRESSURE ACTUATED SWITCHES

have earned their wings

1. *more than 4 years of service experience*
2. *passed all vibration test requirements*
3. *will operate satisfactorily at —100° F. temperatures*
4. *available for 400° F. ambient if required*
5. *accessible external tamperproof adjustment*

and now

6. *stainless steel pressure sensing capsule for corrosive materials*

Wherever a vacuum or pressure change must initiate electric action, Meletron can provide the link.

MELETRON CORPORATION

950 N. Highland Ave., Los Angeles 38

ENGINEERING
COOPERATION
PRODUCTION
"KNOW-HOW"

PISTONS

EXPERTLY DESIGNED
PRECISION-MADE
Specifically for Your
GASOLINE ENGINE

T SLOT

"STEEL BELTED"

TRANSLOT

Original Equipment in America's Finest Motors

WAUKESHA	IHC
GMC	CONTINENTAL
HERCULES	HALL-SCOTT
ENGINES	SEAGRAVE
CORBITT	BUDA
FWD	FEDERAL
DIAMOND-T	MARMON-
TWIN COACH	HERRINGTON
REO	CUMMINS
MACK	

ZOLLNER

PISTON EQUIPMENT

for INTERNAL COMBUSTION ENGINES
– BOTH GASOLINE AND DIESEL

ZOLLNER MACHINE WORKS, FORT WAYNE, IND.

"Makes Any Engine a Better Engine"

FREIGHTLINER

USES SHULER AXLES

THERE ARE NO BETTER AXLES, AT ANY PRICE!

SHULER AXLE COMPANY, Inc.
Louisville, Kentucky

Since 1915, Manufacturers of: One-Piece Tubular and Square Trailer Axles, Front Axles, Machinery Trailer Axles, Machinery Front Axles, Front-Steer Trailing Axles, Heavy-Duty Brakes (Mechanical, Vacuum and Air), House Trailer Axles, Miscellaneous Forgings for Heavy-Duty Trucks and Trailers.

DETROIT OFFICE: 18954 James Couzens Highway • CHICAGO OFFICE: 615 Davis St., Evanston
DALLAS OFFICE: 3402 McFarlin Blvd. • EXPORT DIVISION: 38 Pearl St., New York
WEST COAST WAREHOUSE: 1280 Forty-Fifth St., Oakland